

A review of the East Palaearctic taxa of the *Melitaea didyma* (ESPER, [1779])-group. Part II.

by

KIRILL A. KOLESNICHENKO, SERGEI V. CHURKIN & RUSTAM K. BERDIEV

received 6.VI.2011

Summary: The second part of the review of the *Melitaea didyma* (ESPER, [1779]) complex distributed in the "Russian" Central Asia is presented. The species status is confirmed for *M. mixta* EVANS, 1912, basing on the characters of the genitalia, colouration and cohabitation with *M. didyma* (ESPER, [1779]) in Peter the Great Mts., Tadjikistan. Two new subspecies are described: *M. didyma carminea* **subspec.nov.** (TL: Kyrgyzstan, West Tian-Shan, Chatkal Mts, Chanach river) and *M. didyma chimaera* **subspec.nov.** (TL: Tadjikistan, Peter the Great Mts., 23 km SE Tadjikobad t., Ganishou v.). The lectotype is designated and the type locality is fixed for the taxon *M. didyma nadezhdae* SHELJUZHKO, 1912. Detailed descriptions of all Central Asian subspecies of *Melitaea didyma* (ESPER, [1779]) and *M. mixta* EVANS, 1912 are given, including the characters of the ♂ and ♀ genitalia and distribution.

Резюме: Вторая часть ревизии комплекса видов *Melitaea didyma* (ESPER, [1779]) включает *Melitaea didyma* (ESPER, [1779]) и *M. mixta* EVANS, 1912. Видовой статус последней подтвержден на основании признаков гениталий, окраски крыльев и совместного обитания с *Melitaea didyma* (ESPER, [1779]) на хребте Петра Первого в Таджикистане. Описаны два новых подвида: *M. didyma carminea* **subspec.nov.** (Киргизия, Зап. Тянь-Шань, Чаткальский хр., р. Чанач) и *M. didyma chimaera* **subspec.nov.** (Таджикистан, хр. Петра Первого, 23 км юго-восточнее Таджикобада, к. Ганишоу). Выделен лектотип *M. didyma nadezhdae* SHELJUZHKO, 1912, зафиксирована типовая местность данного таксона. Приведены детальные описания всех центральноазиатских подвигов обоих видов, включая особенности распространения и строения гениталий самцов и самок.

Key words: *Melitaea didyma*, *Melitaea mixta*, Lepidoptera, taxonomy, Central Asia, Tadjikistan, Kyrgyzstan, Kazakhstan, Uzbekistan, zoogeography, new subspecies.

Introduction: The Central Asian group of taxa related to *M. didyma* (ESP.) may be divided into two different complexes basing mainly on the structure of the aedeagus.

KOLESNICHENKO (1999) summarized the data on 5 species of the *ala* STGR.-*chitralensis* MOORE-complex, which are distinguished by the straight (or slightly curved) aedeagus. In the present paper we discuss the taxa of the *M. didyma* (ESP.)-complex with so called U-shaped aedeagus (i.e. *didyma*-complex sensu stricto).

Melitaea didyma (ESP.) is a widely distributed species in the mountains and plains of the «Russian» Central Asia. Different authors described a great number of forms within this taxon in question. The main task of this paper is to determine the real taxonomic status of all described forms from the mentioned region.

STAUDINGER (1886) was the first who indicated *M. didyma* var. *turanica* for the mountains of Kyrgyzstan (type locality - Margelan, Osh, Usgent). This form was regarded later as a variation (RÜHL & HEYNE, 1895; GRUM-GRSHIMAILO, 1890; STAUDINGER & REBEL, 1901; WAGNER, 1913) or as a subspecies of *M. didyma* (SEITZ 1907; BRAMSON, 1910). The name was replaced by SHELJUZHKO (1929) on *turkestanica* as nom. n. pro *didyma turanica* STGR., 1886, nec *M. turanica* ERSCHOFF, 1874. The name *dshungarica* was introduced by OBERTHÜR (1909) as a subspecies for the specimens of *M. didyma* (ESP.) which were taken by GRUM-GRSHIMAILO and identified by him (1896) as *M. didyma perseae* KOLLAR (Dzhing-Ho locality, Boro-Horo Mts.). Later (HIGGINS, 1941) the name *dshungarica* OBERTHÜR was replaced by modification *ambra* HIGGINS (nec *M. sibina dshungarica* GRUM-GRSHIMAILO, 1895).

M. trivialis race *mixta* was described by EVANS (1912) from north-eastern Pakistan (type locality - Chitral) and later was regarded (EVANS, 1932) as a subspecies of *M. didyma* (ESP.). Some new taxa related to *M. didyma* (ESP.) were described by different authors from the region in question: *nadezhdae* SHELJUZHKO, 1912 (type locality - Pamirsky Post, E. Pamirs), *elavar* FRUHSTORFER, 1917 (type locality - Sarafshan, Dukhan), *problematica* SHELJUZHKO, 1929 (type locality - Khorog, W. Pamirs), *pseudoala*+*alboocellata* SHELJUZHKO, 1929 (type locality - Tashkent, Kauntchi [Kamchik]).

The paper dedicated to the geographical variation of *M. didyma* (ESP.) was published by BRYK (1940). For the Central Asian region the author designated so-called "der turanische Kreis" including the subspecies *turkestanica* SHELJ., *elavar* FRUHST., *enarea* FRUHST., *altaica* GR.-GR., *sutschana* STGR., described ssp. *geminella* BRYK (type locality - Kuldscha) and ssp. *sutschanala* BRYK (type locality - "Sibiria orient."). It is necessary to point out that the taxa *altaica* GR.-GR., *sutschana* STGR. and *sutschanala* BRYK are the part of the Siberian *didyma* (ESP.)-group while the situation with the taxon *enarea* FRUHST. was clarified earlier (KOLESNICHENKO, 1999). Some of the taxa described before from the «Russian» Central Asia were not regarded by BRYK at all (*mixta* EVANS, *nadezhdae* SHELJ., *problematica* SHELJ. and others). Also, the author described ssp. *kirgisica* BRYK (type locality - "Kirgis Steppes").

The review of the genus *Melitaea* was published by HIGGINS (1941). He distinguished ssp. *turkestanica* SHELJ. from Tian-Shan and Alai Mts., *M. didyma* mod. *ambra* HIGGINS from 'Dzhungaria', ssp. *mixta* EVANS from Chitral, *M. didyma mixta* mod. *nadezhdae* SHELJ. (Pamirs, Chitral), *M. didyma mixta* mod. *problematica* SHELJ. (W. Pamirs, Chitral). The name *elavar* FRUHST. was introduced by the author for a rather small *occidentalis* STGR.-form near *dalmatina* STGR. HIGGINS (1981) regarded the taxon *mixta* EVANS as a separate species. The forms described by BRYK (1940) were dealt with by HIGGINS (1955). He considered the taxon *geminella* BRYK as a transitional form of *neera* FISCHER DE WALDHEIM to *turkestanica* SHELJ. and ssp. *kirgisica* BRYK as a synonym of *neera* FISCHER DE WALDHEIM.

After HIGGINS' publication the taxonomic situation within the complex in question became extremely tangled (for example the taxa *mixta* EVANS, *problematica* SHELJ. and *nadezhdae* SHELJ. were regarded as subspecies of *M. mixta* EVANS (TUZOV, 1993) or as subspecies of *M. didyma* (ESP.) (TSHIKOLOVETS, 1997, 2003). The situation with the Central Asian forms of *M. didyma* (ESP.) aroused many mistakes in identification in the subsequent publications (KORSHUNOV, 1972; TUZOV 1993; TSHIKOLOVETS, 1997, TSHIKOLOVETS, 2003) and was complicated by the description of a new *M. didyma* ssp. *manoni* HANUS, 1996 (type locality - Kadzhi-Sai, on the southern shore of Issyk-Kul Lake). The book edited by TUZOV (2000) also did not clarify the taxonomic status of the

taxa in question.²

The material examined allows us to speak about two separate but closely related species, which are widely distributed on the territory of the «Russian» Central Asia, producing a number of subspecies. We suggest the situation to be as follows:

The deserts and semi-desert foothills are inhabited by *M. didyma ambra* HIGGINS. The area of this taxon includes the plains of the north-eastern coast of the Aral sea (in the west), the sands of Irtysh River (in the north), penetrates to the deserts of Dzhungaria up to the foothills of the Mongolian Altai, i.e. Dzhingarian Gobi (in the east), includes the dry foothills of the Dzhungar Mountain System. and sands of the Ili Valley (in the south) and through the arid gorges reaches the semi-deserts of the western coast of Issyk-Kul Lake. The distribution area of *M. didyma turkestanica* SHELJ. includes the median altitudes of Tian-Shan with the exception of the western part of it, Alai Mts. and Ghissar Mts.

West Tian-Shan (except Kara-Tau Mts.) is inhabited by *M. d. carminea* subsp. nov.

The area of *M. d. chimaera* subsp. nov. covers Peter the Great Mts. and the neighbouring territories.

Melitaea mixta EVANS is distributed in the mountains of the Pamirs and in the south penetrates the northern Pakistan (Chitral). The species status of this taxon is strongly confirmed by the recently found cohabitation with *M. didyma* (Esp.) in Tajikistan as well as by the genitalia structures. Three subspecies are distinguished within the area of *M. mixta* EVANS: the nominate taxon (North Pakistan), *problematica* SHELJ. (West Pamirs) and *nadezhdae* SHELJ. (East Pamirs).

The present study is based upon the collections of the following institutions: Zoological Museum of Moscow State University, Zoological Institute of Russian Academy of Sciences (St.Petersburg), Darwin State Museum (Moscow), Zoological Museum of Kiev University and collections of the authors and amateur collectors.

We did not indicate the number of the material from each locality, since from every locality dozens of specimens have been examined. The localities with the rare material are specified separately.

In terminology of the wing pattern, wing venation and genitalia we mainly follow HIGGINS (1941). The scheme of the wing pattern and wing venation was figured in KOLESNICHENKO (1999).

All holotypes will be deposited in the Zoological Museum of Moscow State University.

Abbreviations

coll.	- collection
FW	- forewing
HW	- hindwing
ICZN	- International Code of Zoological Nomenclature
Mts.	- mountains
r.	- river
t.	- town
TL	- Type locality
UNH	- underside of hindwing
UNS	- underside
UPF	- upperside of forewing
UPH	- upperside of hindwing
UPS	- upperside
v.	- village
ZMMU	- Zoological Museum of Moscow State University
ZMKU	- Zoological Museum of the Kiev University

Melitaea didyma turkestanica SHELJUZHKO, 1929

M. Didyma O. var. *Turanica* STAUDINGER, 1886, Stettin. Ent. Z. **47**: 231-232 (Margelan, Osch, Ugent).

M. didyma var. *turanica* STAUDINGER; RÜHL & HEYNE (1895), Die palaearktischen Grossschmetterlinge und ihre Naturgeschichte, B. 1: 395, 532, 790 (Osch, Fergana, Turkestan).

M. didyma var. *turanica* STGR.; GROUM-GRSHIMAILO (1890) Mem. Lep. **4**: 429-430 (Oche).

M. didyma turanica STGR.; SEITZ (1907), Grossschm. Erde, **1**: 219, t. 66 (Alexandr-Gebirges).

M. didyma elavar FRUHSTORFER, 1917, Arch. Naturg. **82** (A) 2: 11 (Dukhan, Sarafshan).

M. didyma ssp. *turkestanica* FRUHSTORFER, 1929, Mitt. Münch. Ent. Ges. **19**: 354 (= *turanica* STGR., 1886, nom. praeoccup.).

M. didyma turkestanica SHELJ.; BRYK (1940), Folia Zoologica et Hydrobiologica **10** (2): 331 (Tura, Andishan, Transalai).

M. didyma ssp. *geminella* BRYK (1940), Folia Zoologica et Hydrobiologica **10** (2): 331: 332, Taf. IV: 33 (Kuldscha).

M. didyma elavar FRUHST.; BRYK (1940), Folia Zoologica et Hydrobiologica **10** (2): 333 (Dukhan, Sarafshan).

M. didyma turkestanica SHELJ.; HIGGINS (1941), Trans. Ent. Soc. Lond. **106**: 208, Pl. 2: 1 (lectotype) (Marghilan).

M. didyma turkestanica SHELJ.; TUZOV (1993), The synonymic list of butterflies from the ex-USSR: 47 (Tian-Shan, Ghissar, Alai, Dzhungarsky Tian-Shan, S. Altai).

M. didyma turkestanica SHELJ.; LUKHTANOV & LUKHTANOV (1994) Herbiopoliana **3**: 183 (Tian-Shan, Alai Mts.).

M. didyma turkestanica SHELJ.; TUZOV et. al. (2000), Guide to the butterflies of Russia and adjacent territories **2**: 59, Taf. 38: 7-9.

M. didyma turkestanica SHELJ.; TSHIKOLOVETS (2003), The butterflies of Tajikistan: Pl. LXXII: 1-7

¹ The analysis of the book "The butterflies of Tajikistan" written by TSHIKOLOVETS is out of the limits of our paper, because of many mistakes. Suffice it to say that under the name *nadezhdae* SHELJ. in that book four different taxa are figured.

² Tuzov regarded *M. didyma* (Esp.) as a superspecies. For the region in question he pointed out: 1) *M. (didyma) turkestanica* ssp. *turkestanica* SHELJ. (= *turanica* STGR. nom. praeoc.; = *pseudoala* SHELJ.) - Alai Mts.; ssp. *kirgisica* BRYK, 1940 (= *geminella* BRYK) - Tarbagatai Mts., Saur Mts. and Tian-Shan; ssp. *elavar* FRUHST. - Ghissar; 2) *M. (didyma) mixta* ssp. *mixta* EVANS - Chitral; ssp. *nadezhdae* SHELJ. - E. Pamirs; ssp. *problematica* SHELJ. - W. Pamirs. He believed the taxon *ambra* HIGGINS (= *dschungarica* OBERT., nom praeoc.; = *perplexa* HIGGINS, 1941; = *mannoi* HANUS) to be a distinct species or ecological form of *M. didyma* (Esp.)

TL: The type locality of *M. didyma turkestanica* SHELJ. (nom. n. pro *M. didyma turanica* STGR.) was pointed as “Margelan, Osch and Usgent”, i.e. northern slopes of Alai Mts. and neighbouring part of Fergansky Range. The ♂ lectotype was designated and figured by HIGGINS (1941) from “Margelan”. In this case, following the systematic practice of the work with STAUDINGER's types, the type locality is restricted by the central part of the northern Alai Mts.

♂ (col. pl. 1, 2: 1): Rather large; FW length 20-23 mm, as a rule (19-24.5 mm) in Tian-Shan and Alai Mts., while specimens from Ghissar Mts. are smaller, 19-21 mm, as a rule. UPS ground-colour orange or orange-red. FW with rather wide black marginal border (near 2 mm), fused with internervular marginal black spots. Submarginal series complete and formed by heavily marked black triangular macules, separated from black marginal border, as a rule. UPF discal series regular, formed by usually large black spots merged near costa. UPH discal series reduced or absent. UPH black basal suffusion covers near 1/3 part of wing. UNH submarginal orange fascia rather wide (4-5 mm) and broken by white or yellowish veins. The pale area between UNH submarginal fascia and proximal black lunules weakly developed (with the exception of some specimens from Inner Tian-Shan).

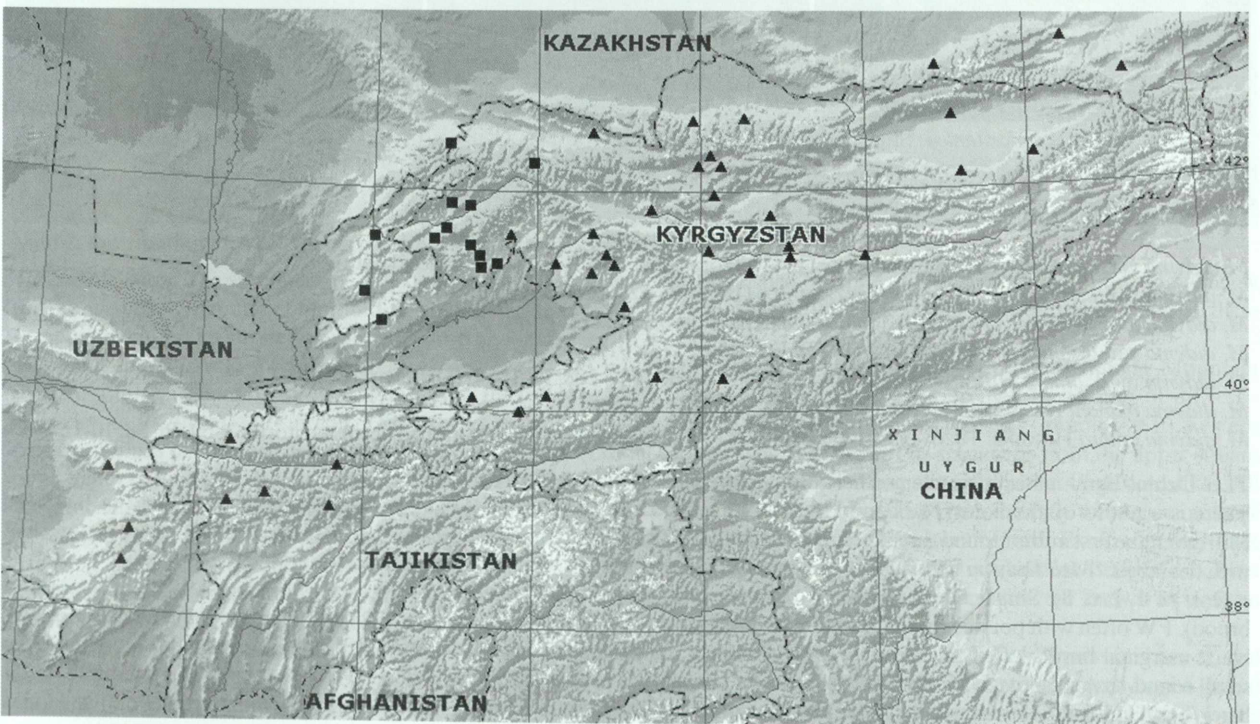
♀ (col. pl. 1, 2: 2): FW length 22-24 mm, as a rule [20-26 (!) mm] in Tian-Shan and Alai Mts., specimens from Ghissar are smaller, 22-23 mm, as a rule (maximum 24 mm). UPS ground-colour variable: from pale yellow-orange to bright red-orange. Black pattern usually well developed and heavily marked. UPF greenish-grey suffusion weakly developed or absent. UNH orange submarginal fascia represented by separate macules. The pale area between UNH submarginal fascia and proximal black lunules more or less developed (especially in the specimens from Inner Tian-Shan).

♂ genitalia (figs. 1-3): Rather large and are characterized by a great variability. Valva (fig. 1: A-N) oval and elongated. Caudal process large and long, with inwardly curved apex. There is a row of teeth near the base of caudal process up to the distal apex of valva. Usually a rather large trident is present near the dorsal surface of distal part of valva. Posterior part of aedeagus (fig. 2: A-J) considerably upturned unlike anterior one. Harpe large (fig. 3: A-L), with a row of rather large spines.

♀ genitalia (fig. 4): characterized by the most massive genital armature among all subspecies of *M. didyma* (ESP.) in the region [especially in the populations from the north-eastern slopes of Alai Mts. (fig. 4: A-B) and Fergansky Mts.]. In a whole genitalia wide, ductus with well developed sclerotized fork-shaped area. Large auricles rather wide. ♀♀ of ssp. *turkestanica* SHELJ. from Ghissar Mountain System have rather small genitalia with less developed dorsal projection in the base of antivaginal plate in comparison with the populations from Tian-Shan Mts (fig. 4: F).

Distribution area (map 1): Northern Tian-Shan (mountain slopes), Inner Tian-Shan (including Naryn r. valley), eastern and southern borders of Fergana Valley, Northern Alai, Ghissar (Ghissarsky, Turkestansky, Serafshansky and other ranges), South Ghissar (Baisuntau).

Locality list: Kyrgyzsky Mts. (Chai-Sandyk, Kara-Balta r., Sussamyr v., Tuz-Ashu pass, Karakol r.), Transili Mts. (Chilik, Kegen pass, Malaja Almaatinka r.), Dzhumgal-Too Mts. (Kindyk R.), Narynsky Mts. (Naryn t.), Moldo-Too Mts. (Kurtka r., 25 km. NE Kazarman v., 45 km NE Kazarman v.), Song-Kol'-Too Mts. (45 km NW Son-kol' Lake), Baidulu Range (20 km S Dolon Pass), Naryn r. (Aktal v., Kara-Zhigach v., Kara-Kul t., Tash-Kumyr t.), Ala-Buka r., Dzhaman-Too Mts. (central and eastern parts), Fergansky Mts. (Arslanbop, Kara-Su Lake, Kyzyl-dzhar v., Kara-Kianyr Mts., Alash Mts., Urum-Bash r., Koldama Pass), Toktogul L. (Sargata), Sussamyr Mts. (Kokomeren r., Kyzyl-Oi v.), Kungei Ala-Tau (Cholpon-Ata), Terskei Ala-Tau (Pokrovka, Bajankol r., 20 km N Kochkorka v.), Fergana valley (Chakmak Pass 35 km S Osh, Jelal-Abad vic.), Alai Mts. (Gultcha, Ak-Bura r., Kara-Hamzaabad, Katran-Too, Aksu r., Koro-Shoro, Iordan/Shahimardan, Anhor pass, Gadzhir, Archa-Bash, Chauvai v, Kyzyl-Kyia t., Sokh r.), Turkestansky Mts. (Matcha Mts., Kumbel' pass, Shakhristan Pass, Voru pass, Kondzharsai), Zeravshansky Mts. (Aman-Kutan), Ghissarsky Mts. (Iskander-Kul' Lake, Tash-Kurgan, Anzob, Kalta-Kol L., Khazor-Chashma L., Nofin Lake, Shing r.), Fanskye Mts. (Madovra v., Artuch camp), Baisuntau Mts. (Kintali).



Map 1: Distribution area of *Melitaea didyma turkestanica* SHELJ. (▲) and *M. didyma carminea* subspec. nov. (■).

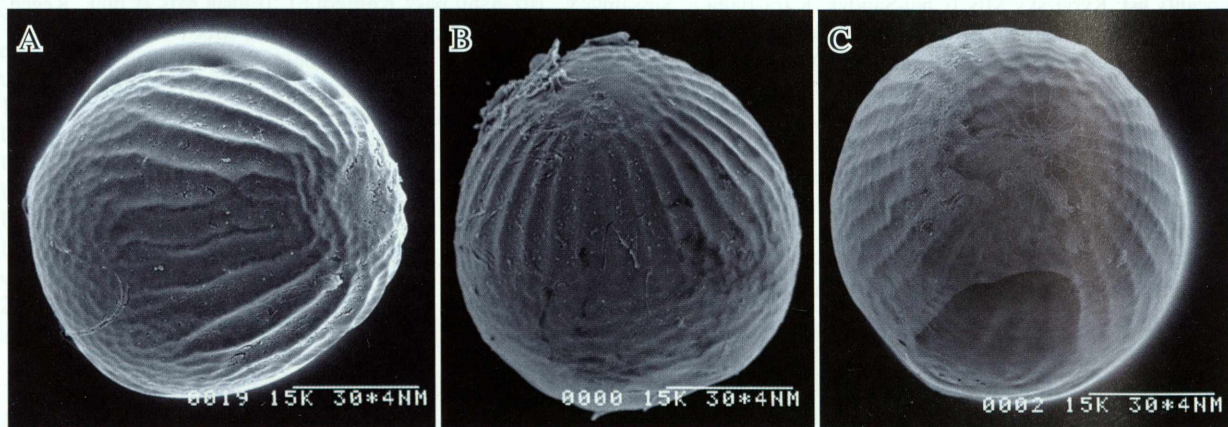
Taxonomic notes: The pronounced and large specimens are distributed on the south-western slopes of Fergansky and northern slopes of the eastern Alai Mts. The butterflies are characterized by large UPS triangular-shaped submarginal spots. The western populations from Inner Tian-Shan (Moldo-Too Mts, Son-Kol'-Too Mts) externally are similar to the specimens from Fergansky and Alai Mts. It is necessary to point that some specimens from Inner Tian-Shan combine the external features of ssp. *turkestanica* SHELJ. and ssp. *ambra* HIGGINS. The first author collected the specimens with such features in the arid and semi-desert valleys. This kind of populations should be regarded externally as transitional between the taxa in question although the structure of the ♂ genitalia (fig. 1: E) evidence for their belonging to the ssp. *turkestanica* SHELJ. The examined material from Toktogul Lake and Sussamyr Valley (Kokomeran R.) have distinctive features of hybridization with the ssp. *ambra* HIGGINS (especially in ♀♀ - UPS ground colour yellowish). But characters of hybridization with the taxa in question in the valley of upper stream of Naryn River are practically absent. We have 3 pale and yellowish specimens among the collected series from low foothills of northern slopes of Alai Mts. (Chakmak, Chauvai) which have the characters of hybridization with ssp. *ambra* HIGGINS (col. pl. 1, 2: 3).

The specimens of *M. didyma* (Esp.) distributed in the western part of Gissar Mts. (col. pl. 1, 2: 4, 5);, Zeravshan Mts. and Turkestan Mts. are more or less moderately different from the Tianshanian populations: the ♀♀ often with much paler UPF ground-colour and slightly reduced UPS black markings. The taxon *elavar* FRUHST. was described from Zeravshan Mts., but in our opinion the characters of ♂♂ and most of ♀♀ of the mentioned population coincide with the characters of ssp. *turkestanica* SHELJ. and quite agree with variability of the last taxon.

It is necessary to concern the real taxonomic status of the form *geminella* BRYK, 1940 from Kuldja (no further data of locality). The external features of this taxon (judging from the description and photo of the ♂ holotype) evidence for its belonging to the ssp. *turkestanica* SHELJ. The material of *M. didyma* (Esp.) (5 ♂♂), which is at our disposal from Kuldja (taken by ALPHERAKY - ex coll. ZISP) undoubtedly belongs to *M. d. ambra* HIGGINS. In our opinion BRYK dealt with the incorrectly labeled specimens. However, from the other hand the interrelations between the forms of *M. d. ambra* HIGGINS and *M. d. turkestanica* SHELJ. in the western part of Chinese Tian-Shan may strongly resemble the correlations of two taxa in question in the western part of Issyk-Kul depression: semidesert foothills are inhabited by *M. d. ambra* HIGGINS, but mountain steppes are inhabited by *M. d. turkestanica* SHELJ. Thus two mentioned taxa do not only have different areas, but are also ecologically segregated from each other.

Ecology and biology: Flies most likely in two generations (often overlapping), the first in May-June, the second in June-July on steppe slopes of mountains up to 1500-2200 m.a.s.l. and over 2500 m.a.s.l. Eggs (fig. A) rather large, oval-shaped with ribs on 1/3 of surface. The number of ribs appears to be less than in the related *M. d. ambra* HIGGINS.

Material examined: 525 ♂♂, 195 ♀♀, including 215 dissections.



A: *Melitaea didyma turkestanica* SHELJ. UZHKO, 1929, egg. Moldo-Too Mts., Kurtka r.; B: *M. didyma ambra* HIGGINS, 1941, egg. Orto-Tokoi L.; C: *M. didyma carminea subspec. nov.*, egg. Chatkal Mts., Chanach r.

Melitaea didyma ambra HIGGINS, 1941

M. didyma var. *dalmatina* STGR.; ALPHERAKY (1881), Horae Soc. Ent. Ros. 6: 403 (vallee de l'Ili).

M. didyma var. *persea* KOLLAR; GRUM-GRZHIMAILO (1896: 40, 525) (Dzhungaria, Dzhin'-Ho).

M. didyma dschungarica (GROUM-GR., in litt.) OBERTHÜR, 1909, Et. Lep. comp. 3: 243.

M. didyma var. *turanica* STGR.; WAGNER (1913), Ent. Mitt. 2 (3): 91.

M. didyma mod. *ambra* HIGGINS, 1941, Trans. Ent. Soc. Lond. 106: 208, Pl. 1: 5-6 (Dzungaria, Amdo).

M. didyma manoni HANUS, 1996, Atalanta 27 (1/2): 207, Pl. IV (2,4).

M. didyma ambra HIGGINS; TUZOV et al. (2000), Guide to the butterflies of Russia and adjacent territories 2: 59, Pl. 38: 10-12.

TL: "Dzhin'-Ho" - a locality in the northern Boro-Horo Mts. (Chinese Tian-Shan).

There is a photo of the holotype of mod. *ambra*, introduced by HIGGINS (1941) at our disposal (holotype is kept in BMNH). Moreover, the first author found three specimens (2 ♂♂, 1 ♀) in ZISP from the type series (which was collected by GRUM-GRSHIMAILO) with the labels "*Mel. Didyma* var. *Persea* / Джунгария [Dzhungaria]" written by GRUM's hand.

♂ (col. pl. 1, 2: 6, 8): Smaller than typical *M. d. turkestanica* SHELJ.: FW length 19-21 mm (even sometimes 17-18 in the second brood). FW often with pointed apex. Ground colour pale orange-yellow or sandy yellow. UPS black pattern thin and delicate. UPS black marginal border often not fused with black interneurular marginal macules. UPF black submarginal series represented by small round-shaped spots. UPF discal black macules not merged near the costa, as a rule. UPH discal series often reduced. UPH black basal suffusion developed only near the base of HW. UNH ground-colour whitish, basal and submarginal orange fascias pale-orange and visibly broken up by white veins.

♀ (col. pl. 1, 2: 7, 9): FW length 21-23 mm (up to 25 mm, rare giants collected in Dzhungaria) FW with pointed apex, as a rule.

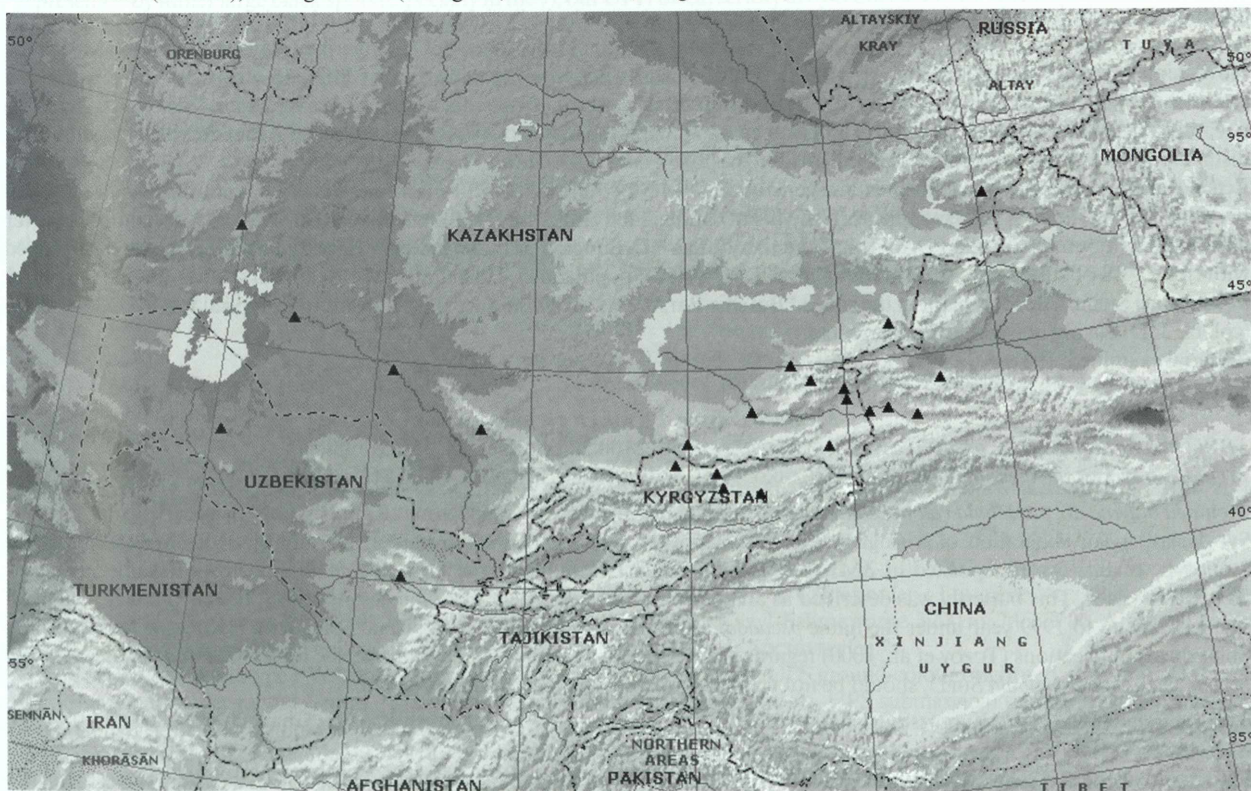
UPS ground-colour often paler than in the ♂♂ and monochrome with well-marked thin and delicate black spots. UPH discal series reduced, as a rule. UNH submarginal orange fascia often broken up into rounded macules.

♂ genitalia (figs. 5-7): Smaller than in ssp. *turkestanica* SHELJ. Valva (fig. 5: A-J) more rounded, caudal process thin and rather short. Base of caudal process often expanded. A row of teeth near the base of caudal process up to the distal apex of valva represented by a few spines as a rule. Aedeagus (fig. 6: A-K) on average rather small and short. Anterior part of it turns into posterior part of it without noticeable prominence on the ventral surface in the central part. Harpe rather thin (fig. 7: A-K), with small spines.

♀ genitalia (fig. 8: A-E): Similar to those of *M. didyma turkestanica* SHELJ., but smaller. In the ♀♀ of the taxon *ambra* HIGGINS the junction of ductus with antivaginal plate is situated near the base of antevaginal plate (in lateral view). It is essential to note that all mentioned features are not permanent for the taxa in question. In addition ♀♀ with transitional characters exist in different populations.

Distribution (map 2): Boro-Khoro, Dzhungaria (including ranges of South Dzhungaria), Ili-Tekes-Kunges river valleys (foothills of the neighbouring ranges), northern foothills of North Tian-Shan (i.e. Kyrgyzsky Alatau, Transili Alatau), Talas river valley, Boom valley, shores of Issyk-Kul and Orto-Takoi water reserve (including neighbouring foothills, very close to the known localities of *turkestanica* SHELJ.), desert plains of eastern Kazakhstan, Dzhungarian Gobi (SW Mongolia).

Locality list: Boro-Horo Mts. (Dzhin'-Ho), Kul'dzha t. vicinity, Dzhungar Ala-Tau (Koktuma v., Rudnichny), Burhansarytau Mts. (Usek), Tyshkantau Mts. (Dzharkent), Katutau Mts. (Koibyn valley), Ketmen Mts (Tuyuk), Ili Valley (Chinese Ili River, Ilyisk, Boguty, Ulken-Boguty), Chinese Tian-Shan (Koungess, Karnak), Alma-Ata vicinity, Bishkek vicinity (Mazar, Manas airport), Chu-Ili Mts. (Kurdai), Talas r. valley (Echkilu-Too, Aral), Orto-Tokoi Lake, Issyk-Kul Lake (Balyk-Chi v., Khadzhi-Sai v., Tamga v., Karatau gorge), Boom Valley (Kok-Mainak v.), NE Kazakhstan (Kal'dzhir, Kinderlik), E Kazakhstan (Taldy-Kurgan), Karakalpakia (Takhta-Kupyr), Kyzyl-Orda t., North coast of Aral Sea (Kazalinsk, "Bol'shie Barsuki" Desert), Nuratau Mts., W. Kara-Tau Mts (Kantau), Dzungar Gobi (Mongolia, Hovd aimak, Bulgan somon).



Map 2: Distribution area of *Melitaea didyma ambra* HIGGINS, 1941 (▲).

Taxonomic notes: The specimens of *M. d. ambra* HIGGINS are easily distinguished (in spite of a great variability) by sandy-yellow (or orange-yellow) ground-colour and thin and delicate black pattern. HIGGINS (1941) noted that the external features of these exceptional butterflies strongly suggested a desert habitat.

The most characteristic specimens of *M. d. ambra* HIGGINS inhabit the deserts and arid foothills around Dzhungar Mountain System: southern slopes of Burhansarytau Mts., the valley of upper stream of Ili River (Ili v.) up to the Chinese part of it (5 ♂♂ - collection of PRZHEVALSKIY - ex coll. ZISP), the vicinity of Kul'dzha town (5 ♂♂ - collection of ALPHERAKY - ex coll. ZISP), western part of foothills of the northern slopes of Boro-Horo Mts. (Dzhin'-Ho) (col. pl. 1, 2: 6, 7). The specimens from the upper stream of Ili Valley (Chinese part) have small size, while the Kazakhstan part of Ili River (Ili v.) is inhabited by rather large butterflies. All these localities concern the southern part of Dzhungar Mountain System and Boro-Horo Mts. There are only three specimens of *M. didyma* (Esp.) from the northern slopes of Dzhungar Ala-Tau (Koktuma v.), which are at our disposal. Externally they look like *M. d. ambra* HIGGINS and the features of genital armature suggest their belonging to the taxon in question. Besides Koktuma only one specimen taken from Rudnichny v. and one specimens from the sands near Taldy-Kurgan town are known to us from Dzhungar Ala-Tau. Undoubtedly these specimens also must be attributed to *M. d. ambra* HIGGINS.

The taxon *manoni* HANUS (col. pl. 1, 2: 8, 9), which was described from the south-western part of Issyk-Kul Depression have no real distinctive external features (with the exception of smaller size) in comparison with typical *M. d. ambra* HIGGINS. Moreover, the genital structures are more or less similar in both taxa. *Melitaea d. ambra* HIGGINS penetrates to the western shore of Issyk-Kul Lake from the deserts of Ili Valley through arid Boom Gorge from which this taxon is also known for us (Kok-Mainak v.). The appearance of *M. d. ambra* HIGGINS specimens is so striking with the respect to *M. d. turkestanica* SHELJ. that it seems we deal with two different species. This

presumption is confirmed by the differences in the ♂ genitalia between the form *manoni* HANUS (fig. 6: E-F) and *M. d. turkestanica* SHELJ. (fig. 1: G). However, the forms with intermediate external features (between *M. d. turkestanica* SHELJ. and *M. d. ambra* HIGGINS) inhabit the semi-desert valleys on the western territory of Inner Tian-Shan (Naryn Valley, Sussamyr Valley, etc.). On the base of our data, these specimens sometimes have pale ground-colour with delicate black pattern. In ♀ the upper surface externally looks like *M. d. ambra* HIGGINS. However, rather large size and the structure of male genitalia evidence for their belonging to the *M. d. turkestanica* SHELJ. (fig. 1: E). The same situation may be observed between the populations of *M. d. ambra* HIGGINS and *M. d. turkestanica* SHELJ. on Kyrgyzsky Mts. and Transili Ala-Tau. The dry plains are inhabited by the first taxon while the more humid mountains are inhabited by *M. d. turkestanica* SHELJ. Male UNH black pattern of these populations is not so delicate than in *M. d. ambra* HIGGINS, but UPS black marginal internervular spots are not fused with black marginal border. UPS of the ♀ is similar to that of *M. d. ambra* HIGGINS ♀.

Butterflies with the external features of *M. d. ambra* HIGGINS inhabit deserts of Kazakhstan and Uzbekistan. There are rather large series of *M. didyma* (Esp.) from the sands of Aral Sea ("Bol'shie Barsuki" Desert, Kazalinsk), which are at our disposal (ex coll. ZISP and our collection) and from Karakalpakia (Tahta-Kupyr v. - ex coll. SAMODUROV and ZAMESOV) with well-developed external features of *M. d. ambra* HIGGINS (UPS delicate black pattern, pointed FW apex, yellowish-orange ground colour).

A rather large series of *M. didyma* (Esp.) taken in the vicinities of Kyzyl-Orda town was found in ZMMU (TSVETAEV coll.). The external features of this population evidence for their belonging to *M. d. ambra* HIGGINS. The area of *M. d. ambra* HIGGINS covers Kara-Tau Mts. and Talas Valley. The external features of two specimens (1 ♂, 1 ♀ at our disposal - ex coll. ZISP) from E. Kazakhstan collected in the sands of Black Irtysh Valley (Kal'dzhir) and Zaisan Hollow (Kinderlik) differ not from typical *M. d. ambra* HIGGINS. Similarities in appearance and in ecological conditions of habitat allow us to determine these specimens as *M. d. ambra* HIGGINS. It is necessary to point out that typical *M. didyma* (Esp.) inhabits the foothills of Saur Mts. There is a good series of *M. didyma* (Esp.) from Saur Mts. (Zhemenev r.), which is at our disposal, flying on the steppe-like slopes. This case confirms the separation of the taxon *ambra* HIGGINS either geographically (its distribution area includes the plains of Turan and N. Kazakhstan) or ecologically (inhabits deserts and semi-deserts).

Some other specimens (2 ♂♂, 2 ♀♀ - ex larva) of the *M. d. ambra* HIGGINS were taken in Dzhungarian Gobi (southwestern Mongolia: Hovd Aimak, Bulgan somon, Uvhod-Ula Mt. - ex coll. YAKOVLEV). ♀♀ and ♂♂ show no distinct differences from the taxon in question (pale orange-yellow ground colour with delicate and thin black pattern); the genital armature was figured earlier (KOLESNICHENKO & CHURKIN, 2004). *Melitaea d. ambra* HIGGINS appears to inhabit the majority of «Russian» Central Asian deserts without serious distinctions in the external features, and the area of this taxon covers the Turan Plains.

Ecology and biology: Flies most likely in one generation in May or June in deserts or semi-deserts. In the mountains of Tian-Shan (western coast of Issyk-Kul Lake) appears to fly in July and inhabits inner loamy deserts up to 1000 -1800 m.a.s.l., sometimes over 2000 m.a.s.l. (mountains around Orto-Tokoi and the southern Dzhungar mountain system). Eggs (fig. B) rather small, oval-shaped with ribs on 1/3 of surface (we studied the eggs of the Issyk-Kul population). The number of ribs appears to be more than in *M. d. turkestanica* SHELJ. The food plant in the sands "Bol'shie Barsuki" is *Artemisia* spec. Larva seems to be typical for *M. didyma* (Esp.) (col. pl. 3: D) having no significant differences.

Material examined: 193 ♂♂, 128 ♀♀, including 137 dissections.

Melitaea didyma carminea subsp. nov.

M. didyma turkestanica ab. *pseudoala* SHELJUZHKO, 1929, Mitt. Münch. Ent. Ges. 18: 355 (Kauntshi).

M. didyma turkestanica ab. *alboocellata* SHELJUZHKO, 1929, Mitt. Münch. Ent. Ges. 18: 355 (Kauntshi).

Melitaea didyma ab. *pseudoala*+*alboocellata* were described by SHELJUZHKO (1928) from "Kauntshi (unweit von Tashkent, Provinz Syr-darja)" as an aberration of a single ♀. Kauntshi appears to be the Kamchik pass in Kuraminsky Mts. We examined the monotype of this taxon deposited in ZMKU (col. pl. 3: 1, 2). Undoubtedly the form *pseudoala* SHELJ. is a melanic variety of *M. didyma* (Esp.). This butterfly was described as an aberration (it is also clear from the description). The taxon mentioned in all publications up to 1999 year under the name *pseudoala* SHELJ. must be treated as *M. ninae* SHELJUZHKO (KOLESNICHENKO, 1999). Subsequent publications (TUZOV et al., 2000) regarded the mentioned taxon as an infrasubspecific form of *M. didyma turkestanica* SHELJ. The name *pseudoala* SHELJ. should be not valid according to the ICZN (article 45.6.4).

Type material: Holotype ♂, Kyrgyzstan, Chatkal Mts., 25 km NE Zhany-Bazar v., Kanish-Kia vill., Chanach river, 2600, 14.07.1999, K. KOLESNICHENKO.

Paratypes: 34 ♂♂, 15 ♀♀, Kyrgyzstan, Chatkal Mts. 25 km NE Zhany-Bazar v., Chanach r., 2600 m, 14.07.1999, K. KOLESNICHENKO leg.; 15 ♂♂, 10 ♀♀, Kyrgyzstan, Chatkal Mts., Chap-Chama pass, 2800 m, 19.07.1999, K. KOLESNICHENKO leg.; 20 ♂♂, 11 ♀♀, Kyrgyzstan, Chandalash Mts., Chak-Mack Su r., 2800 m 16.07.2000, K. KOLESNICHENKO leg.; 6 ♂♂, 5 ♀♀, Kyrgyzstan, Pskemsky Mts., Dzhany-Bazar vic., Chandalash r., 12.07.2000, K. KOLESNICHENKO leg.; 5 ♂♂, 3 ♀♀, Kyrgyzstan, Chatkal R., Kara-Terek, 6.06.2000, 1600-1800 m, A. KLIMENKO leg.; 1 ♂, Kyrgyzstan, Chatkal Mts., Chap-Chama pass, 3000 m, 18.-19.07.1999, A. KLIMENKO leg.; 1 ♂, Kyrgyzstan, Chatkal R. vall., Kurulush v., 8.06.2001, 1400 m, S. CHURKIN leg.; 2 ♂♂, 2 ♀♀, Kyrgyzstan, Chatkal R. vall., Ravat-Sai R., 8.-9.06.2001, 1600-1800 m, S. CHURKIN leg.; 2 ♂♂, 1 ♀, Kyrgyzstan, Chatkal Mts., Chanach Pass, 3200 m, 11.-12.07.2001, S. CHURKIN leg.; 4 ♂♂, 1 ♀ Kyrgyzstan, Chandalash Mts., Kurgan-Sai v., 2400-2600 m, 8.-10.07.1999, K. KOLESNICHENKO leg.; 10 ♂♂, 5 ♀♀, Uzbekistan, Kuraminsky Range, Kamchik Pass, 2300-2500 m, 11.-13.07.1997, S. VASHCHENKO leg.

Additional material: 4 ♂♂, 2 ♀♀, Chatkal (eastern macroslopes) near Terek-Sai v., 1600 m, 14.07.2000, K. KOLESNICHENKO leg.; 3 ♂♂, 1 ♀, eastern edges of Chatkal Mts., Zhoi-Belent v., 1000 m, 9.07.2000, K. KOLESNICHENKO; 5 ♂♂, Southern edges of Chatkal, Sumsar v., S. CHURKIN leg.; 23 ♂♂, 4 ♀♀, Talas Alatau (Kara-Bura r., Aksu-Dzhabagly); 7 ♂♂, 5 ♀♀, Bosbu-Too Mts., Bos-Byik v., 1700-2100 m, 1.07.2008, S. CHURKIN leg.

♂ (col. pl. 1, 2: 1): Holotype FW length - 19 mm, paratypes 19-20 mm (with very rare exceptions, the size is not so variable). Ground colour bright red or bright red-orange. FW with yellowish spot near apex. UPS marginal band narrow (marginal spots often separated from marginal band). UPF submarginal series represented by rather small black triangular spots. UPF discal series with black spots (often absent) between veins 3 and 4. UPH discal series reduced, as a rule. UPH black basal suffusion not covering anal angle. UNF ground colour orange-red. UNH white area often with slight red suffusion, UNH black pattern fine and delicate, fascias orange-red. Abdomen with red spots on each segment on both sides (in *M. d. turkestanica* and other subspecies it is whitish or yellowish).

♀ (col. pl. 1, 2: 1): FW length 19.5-23.5 mm (20-22 mm, as a rule). Externally like ♂♂, but ground colour sometimes paler. In some

specimens UPF with slight greenish suffusion.

♂ genitalia (figs.9-11): Rather large compared to the size of the butterflies. Valva (fig.9: A-H) oval and elongated as in *M. d. turkestanica* SHELJ. Caudal process large and long, with inwardly curved apex. The row of teeth near the base of caudal process often absent; only a few spines near dorsal surface of distal part of valva. Aedeagus (fig.10: A-F) similar to that of *M. d. turkestanica* SHELJ. Harpe (fig.11: A-F) with a row of rather small spines.

♀ genitalia (fig.12: A-D): Resemble *M. d. turkestanica* SHELJ. but smaller. The junction of ductus with antivaginal plate situated near the base of antivaginal plate (in lateral view).

Distribution (map 1): Kuraminsky Mts. (Kamchik pass.), Chatkal Mts. (Chimgan, Shavaz r., Chanach r., Chap-Chama pass, Kassan-Sai v., Terek-Sai v., Zhoi-Belent v.(=Oruktu), Sumsar v., Dzhyanybazar v.), Chandalash Mts. (near Kurgan-Sai v., Chak-Mak-Su river), Pskem Mts. (Chandalash river).

Taxonomic notes: This outstanding form strikingly differs from all known taxa of *M. didyma* (Esp.) first of all by the UPS bright-red ground colour. In spite of distinctive external features and some differences in the ♂ genitalia, *M. d. carminea* subsp. nov. has only subspecific status. There is a rather large material, which is at our disposal from the adjacent territories of the area of the new subspecies. The specimens from Talas Ala-Tau (Aksu-Dzhabagly v. - 3 ♂♂, 1 ♀; Kara-Bura r. - 20 ♂♂, 3 ♀♀) seem to be transitional forms to the *M. d. ambra* HIGGINS (col. pl. 1, 2: 12,13): In these specimens UPS red ground colour is not so bright, ♀♀ UPS ground colour yellowish. The same specimens were taken in Karzhan-Tau Mts (Humsan v. - 3 ♂♂, 2 ♀♀) in the northern part of West Tian-Shan. It is necessary to point out that UPS ground colour of *M. didyma* (Esp.) collected on the south-eastern slopes of Chatkal Mts. (Zhoi-Belent v., Kassan-Sai R., Sumsar v., Bosbu-Too Mts. (Bos-Byik v.)) has a tendency (but to a lesser degree) to be red-orange. ♀♀ have red UPS ground colour and are often similar to the ♂♂. It is necessary to point out that the hybridization with the *M. d. ambra* HIGGINS is practically absent in spite of relatively low-altitude habitat (the material from Sumsar v. was taken from arid biotopes at about 1000 m).

The population of *M. didyma* (Esp.) from Tash-Kumyr t. is externally similar to *M. d. turkestanica* SHELJ.: UPS submarginal band represented by rather large black spots (especially in the ♀), but UPH discal series partly reduced, ♂ UPF discal spots reduced between veins 3 and 4, UPH black basal suffusion absent in the male and poorly developed in the ♀. The specimens from Kara-Kul town (2 ♂♂, 2 ♀♀) and Padsha-Ata River from the eastern slopes of Chatkal Mts. (6 ♂♂, 2 ♀♀) are typical representatives of *M. d. turkestanica* SHELJ. The last situation is very interesting and closely resembles the interrelation between the typical *M. minerva* STAUDINGER, 1881 from the vicinity of Sary-Chelek Lake (north-eastern slopes of Chatkal Mts.) and *M. minerva tersa* KOLESNICHENKO & CHURKIN, 2000 which inhabits the north-western slopes of Chatkal Mts. (KOLESNICHENKO & CHURKIN, 2003). Chatkal Mts. seems to be the natural border between the fauna distribution of Western Tian-Shan and eastern part of it.

Ecology and biology: Specimens fly most likely in one or two broods. In the last case the generations overlap. Specimens from Chatkal Mts., Chandalash Mts. and Pskem Mts. fly on the steppe-like slopes with Prangos sp. up to 2600-2800 m.a.s.l. (even 3200 m.a.s.l.). In the vicinity of Zhoi-Belent v. (SE slopes of Chatkal Mts.) they occur up to 1000-1500 m.a.s.l. in the arid or semi-desert habitats. Eggs (fig. C) of the specimens from Chatkal Mts., Chap-Chama pass are similar to those of the form *M. d. turkestanica* SHELJ.

Material examined: 120 ♂♂, 61 ♀♀, including 85 dissections.

Melitaea didyma chimaera subsp. nov.

M. enarea enarea FRUHST.; TUZOV et. al. (2000), Guide to the butterflies of Russia and adjacent territories 2: 59, Taf. 38: 19-21 (Peter I Mts., Darai-Nazarak).

Type material: Holotype ♂, Tadjikistan, Peter the Great Mts., 23 km SE Tadjikobod t., Ganishou v., 26.-30.06.2003, O. PAK leg. Paratypes: 8 ♂♂, 5 ♀♀, same loc., 24.-27.06.2003, A. PETROV leg.; 5 ♂♂, 5 ♀♀, same loc., 24.-27.06.2003, O. PAK leg.; 1 ♂, same loc., 2200-2500 m, 10.-20.07.2000; 1 ♂, same loc., 2100 m, 25.06.1980; 1 ♂, Tadjikistan, Peter the Great Mts., Darai-Nazarak v., 1.-8.07.2003, O. PAK leg.; 1 ♀, same loc., 1.-15.08.2003, O. PAK leg.

Additional material: 10 ♂♂, 11 ♀♀, Tadjikistan, Peter the Great Mts., Muk v., 2100-2800 m, 22.-30.07.2009, S. SALUK leg.; 4 ♀♀, same loc., 2200-2400 m, 15.-19.08.2000, O. PAK leg.; 4 ♂♂, S. Tadjikistan, Shuarobad, 3.-5.07.2003, V. PEREPECHAENKO leg.; 2 ♂♂, 1 ♀, Kyrgyzstan, West Transalai, Aram-Kungei vall., 2900-3000m, 10.07.1992, S. CHURKIN leg.; 1 ♂, same loc., 3000 m, 2.07.1994, L. CHURKINA leg.; 1 ♂, same loc., 20.07.1998; 1 ♂, Kyrgyzstan, South Alai, Kyzyl-Eshme gorge, 3200 m, 7.07.2006, A. ZHDANKO leg.; 1 ♀, Kyrgyzstan, Alai valley, Daraut-Korgon v., Kyzyl-Su r., 7.-8.07.2008, A. SOCHIVKO leg.

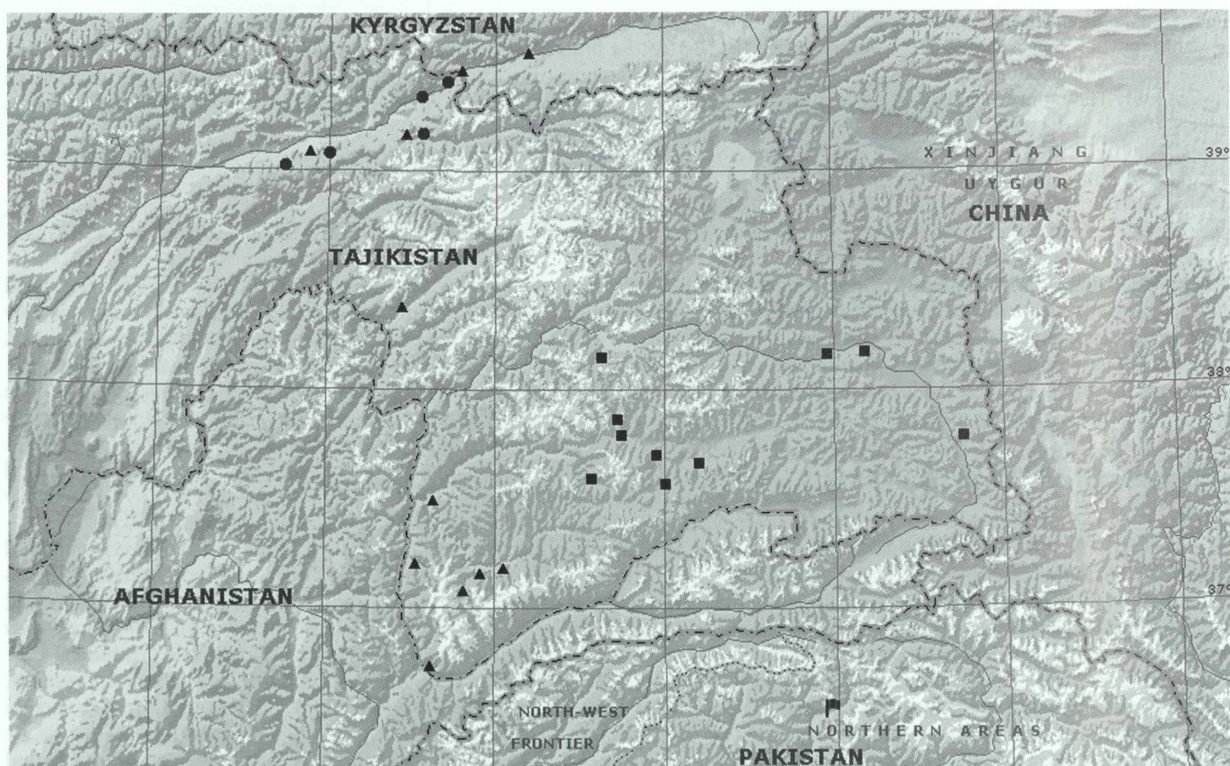
♂ (col. pl. 1, 2: 14): Holotype FW length 19 mm, paratypes 19-20 mm, as a rule. UPS ground-colour bright-red. FW with rather wide black marginal border (about 2 mm), fused with internervural marginal black spots. UPS submarginal series formed by sharpened lunules often connected with marginal black border. This character is constant. The specimens with intermediate characters between the new subspecies and populations of ssp. *turkestanica* SHELJ. from Ghissar Mts. often occur in the eastern part of Ghissar Mts. UPF discal series complete and formed by usually large black spots merged near costa. UPH discal series reduced or absent. In the UPF postdiscal area near the base and inner border of the wing 8-shaped or 0-shaped spot is situated. In the UPH postdiscal area there is black basal suffusion covers near 1/3 part of the wing. UNH submarginal orange fascia rather narrow (not more than 4 mm) and broken by yellowish veins. The pale area between UNH submarginal fascia and proximal black lunules weakly developed. UNH black pattern thin and delicate. Abdomen with orange or red scales on the ventral side (in comparison with *M. mixta problematica* SHELJ. which flies together with *M. didyma chimaera* subsp. nov.), and the colour of them is similar to the colour of UNH orange fascia. It is necessary to point out that this feature rather separates *M. d. chimaera* subsp. nov. from other subspecies of *M. didyma* (Esp.): in *M. d. ambra* HIGGINS and most part of *M. d. turkestanica* SHELJ. abdomen from the ventral side with yellowish scales.

♀ (col. pl. 1, 2: 15): FW length 20-22 mm. UPF ground colour pale yellow-orange as a rule. Black pattern usually heavy, but UPF greenish-grey suffusion usually absent. UPS submarginal series formed by sharpened lunules often connected with marginal black border. UNH ground colour yellowish, UNH submarginal orange fascia broken by yellowish veins. The pale area between UNH submarginal fascia and proximal black lunules poorly developed. UNH black pattern thin and delicate.

♂ genitalia (figs.13-15): Rather large. Valva (fig.13: A-D) oval and elongated. Thin and long caudal process with inwardly curved apex. The row of teeth near the base of caudal process represented by a few spines disposed near dorsal surface of distal part of valva. Aedeagus (fig.14: A-D) with a noticeable prominence on the ventral surface in the middle. Harpe (fig.15: A-D), C often with two pronounced and rather large spines and directed strongly inwards (in lateral view of valva), in contrast to *M. mixta* EVANS.

♀ genitalia (fig. 16): similar to those of *M. d. turkestanica* SHELJ. Fork-shaped sclerotized area of ductus dorsally less developed (especially in comparison with *M. mixta problematica* SHELJ. from Peter I Mts.).

Distribution (map 3): Darvaz Mountain system: Darvaz Mts. (Viskharvi v., Haburobod pass), Hazreti-Sho Mts. (Bomolo, Dushkan, Shuarobad), Peter I Mts. (Ganishou v., Gardani-Kaftar pass, Tovil-Dara v., Garm t.), western part of Alai Valley (Aram-Kungei, Daraut-Kurgan v.), southern slopes of Ghissar Mts (Karatag r., Varzob vall.).



Map 3: Distribution area of *Melitaea didyma chimaera subspec. nov.* and *M. mixta* EVANS, 1912. *M. d. chimaera subspec. nov.* (●), *M. mixta mixta* EVANS (■), *M. mixta problematica* SHELJ. (▲), *M. mixta nadezhdae* SHELJ. (■).

Taxonomic notes: Large specimens are distributed on the northern slopes of Peter the Great Mts. The butterflies are characterized by large UPS triangular-shaped submarginal lunules. It is necessary to point out that the specimens of *M. d. chimaera subspec. nov.* from Peter I Mts (Ganishou) fly together with *M. m. problematica* SHELJ. (col. pl. 1, 2: 17, 18, 19). The butterflies of *M. d. chimaera subspec. nov.* well differ from the *M. m. problematica* SHELJ. both as in the pattern of UNH, as in the structure of the ♂ genitalia.

Melitaea didyma (Esp.) from the southern slopes of Ghissar Mts. (Varzob r. and Karatag r.) must be attributed to *M. d. chimaera subspec. nov.* These butterflies have external features of *M. d. chimaera subspec. nov.*, but with the residual traces of hybridization with *M. d. turkestanica* SHELJ. from the western and northern Ghissar Mts.

Western and northern populations from Hazretisho Mts., Muk v. (Peter I Mts.) and western part of the Alai Mountain system are smaller, with external features of *M. d. chimaera subspec. nov.* However, ♀♀ from Muk v., taken from lower altitude are rather large and similar in size to the ♀♀ from Ganishou (Peter I Mts.). Perhaps we are dealing with an ecological form of *M. d. chimaera subspec. nov.* which decreases in size being associated with unfavourable ecological conditions of high mountains. Unfortunately we have no final conclusion about the mentioned populations because the material is not sufficient.

Ecology and biology: Flies most likely in two generations: first in May-June, second in June-July at grassy slopes up to 3000 m.a.s.l. and even higher, in contrast to *M. m. problematica* SHELJ.

Material examined: 36 ♂♂, 28 ♀♀, including 30 dissections.

Melitaea mixta EVANS, 1912

In scientific literature the real status of the taxon *mixta* EVANS was unclear and mostly referred to as a subspecies of *M. didyma* (Esp.) (see Introduction). The specific status of *M. mixta* EVANS was introduced by HIGGINS (1981) but without any indication of reasons. In 2004, the expedition organized by the second author to the Peter I Mts. found out the sympatric occurrence of *M. d. chimaera subspec. nov.* and *M. mixta problematica* SHELJ. in the vicinity of Ganishou v. (Peter I Mts.). Both species lived in the same territory, but in different habitats.

Melitaea mixta EVANS is distributed in the mountains of Pamirs, NE Afghanistan (SAKAI, 1981) and NE Pakistan. Different authors traditionally distinguished three forms of *M. mixta* EVANS: *nadezhdae* SHELJ. (E. Pamirs), *problematica* SHELJ. (W. Pamirs) and the nominate taxon (Chitral, NE Pakistan). Numerous material on the species in question from East and West Pamirs (which is at our disposal) suggests the existence of two different geographical forms, inhabiting the territory of the "Russian" Central Asia, which differ in the external features. Unfortunately, there is only one ♂ of *M. m. mixta* EVANS which is at our disposal (topotype) with the external characters similar to those given in the description by HIGGINS (1941)³. Externally, this specimen does not look like *M. m. problematica* SHELJ. and *M. m. nadezhdae* SHELJ. However, high individual variability of *M. mixta* EVANS sometimes exceeds the geographical one [for example, HIGGINS (1941) separated the taxa *mixta* EVANS, *problematica* SHELJ. and *nadezhdae* SHELJ., but he regarded the last two forms as modifications]. Thus, the question about the interrelations between the taxa *mixta* EVANS and *problematica* SHELJ. remains open. In this paper we hold the current opinion about the existence of three subspecies of *M. mixta* EVANS.

³ TUZOV regarded *M. didyma* (Esp.) as a superspecies. For the region in question he pointed out: 1) *M. (didyma) turkestanica* ssp. *turkestanica* SHELJ. (= *turanica* STGR. nom. praeoc.; = *pseudoala* SHELJ.), Alai Mts.; ssp. *kirgisica* BRYK, 1940 (= *geminella* BRYK), Tarbagatai Mts., Saur Mts. and Tian-Shan; ssp. *elavar* FRUHST., Ghissar; 2) *M. (didyma) mixta* ssp. *mixta* EVANS, Chitral; ssp. *nadezhdae* SHELJ., E. Pamirs; ssp. *problematica* SHELJ., W. Pamirs. He believed the taxon *ambra* HIGGINS (= *dshungarica* OBERT., nom. praeoc.; = *perplexa* HIGGINS, 1941; = *mannoi* HANUS) to be a distinct species or ecological form of *M. didyma* (Esp.).

⁴ The description of EVANS (1912) is short and incomplete.

Melitaea mixta mixta EVANS, 1912

M. trivia race *mixta* EVANS, 1912, J. Bombay Nat. Hist. Soc. **21**: 583 (Chitral).

M. didyma mixta EVANS, 1932, Ident. Ind. Butt. (Ed. 2): 185.

M. didyma mixta EVANS; HIGGINS, 1941, Trans. Ent. Soc. Lond. **91** (7): 209, Pl. 2: 6, 12 ♂.

M. mixta EVANS; HIGGINS (1981), Bull. Brit. Mus. Nat. Hist. Ent. **43** (3): 166.

There is a photo of the holotype of the taxon *mixta* EVANS (deposited in BMNH) and only one ♂ (collected on Shandur pass), which are at our disposal. The ♂ externally looks like typical *mixta* EVANS.

Type locality: Chitral (NE Pakistan)

♂ (col. pl. 1, 2: 16): Moderate size. Ground colour red (our specimen) or orange-red (in the type). Marginal border fused with marginal black spots. UPS submarginal series complete and represented by lunules connected with marginal black border (submarginal lunules not connected with marginal border in the type specimen). As it was pointed out by HIGGINS (1941), UPH discal black spots joined in a thin curved line (it is the author's opinion that this external character is the distinctive feature of the nominate taxon). The joined black spots are present at UPH of our specimen, but in our opinion this row is formed by black spots situated basally from discal band: true discal macules in our specimens are absent. As it is clear from the figure of the nominate subspecies given by HIGGINS (1941) the author means just spots situated basally from discal band. It is necessary to point out that the mentioned feature is absent in other described forms related to *M. mixta* EVANS (*nadezhdae* SHELJ., *problematica* SHELJ.). UPF discal series is represented by equal black macules in contrast to *M. d. chimaera subspec. nov.* (UPF black macules in the central part of discal band smaller, as a rule). UPH black basal suffusion well developed. UNH orange submarginal fascia narrow.

♀: Pale and closely resembles the ♂ (HIGGINS, 1941). The ♀ is unknown to us.

♂ genitalia (fig.17: A-C): Comparatively small. Valva (fig.17: A) oval and slightly tapered in the distal part. Thin and rather short caudal process directed downwards. A few little spines disposed on the ventral surface of it. There is a row of teeth near the base of caudal process up to the distal apex of valva.⁴

Anterior part of aedeagus (fig.17: B) transits to posterior part of it without noticeable prominence on the ventral surface in the central part. Harpe (fig.17: C) with some pronounced and rather large spine and directed perpendicularly to the plane of valva [i.e. directed strictly inwards so that it is not obvious from the lateral view in oposite centralasian taxa of *M. didyma* (Esp.)].

Distribution (map 3): Chitral (north-eastern Pakistan, Shandur pass).

Ecology and biology: This is a high mountain form. The specimen at our disposal was taken in the mountains up to 3700-4000 m in the beginning of July.

Melitaea mixta problematica SHELJUZHKO, 1929

M. didyma Forma *problematica* SHELJUZHKO, 1929, Mitt. Münch. Ent. Ges. **19**: 357 (Chorog).

M. didyma mixta mod. *problematica* SHELJUZHKO; HIGGINS (1941), Trans. Ent. Soc. Lond. **91** (7): 211, Pl. 3: 8.

M. mixta problematica SHELJ.; TUZOV (1993), The synonymic list of butterflies from the ex-USSR: 47.

M. didyma problematica SHELJ.; TSHIKOLOVETS (1997), The Butterflies of Pamirs: 118, Pl. XXVIII: 10-12; Pl. XXIX: 10-12, ; Pl. XLIII: 2 (Chorog).

M. didyma mixta (?) EVANS; TSHIKOLOVETS (1997), The Butterflies of Pamirs: Pl. XXVIII: 15 (Ishkashimsky Mts., Pish).

M. chitralensis shugnana SHELJ., TSHIKOLOVETS (1997), The Butterflies of Pamirs: Pl. XXVIII: 9; XXIX: 9 (Shugnansky Mts. Pish).

M. didyma ishkashima SHELJ.; TSHIKOLOVETS (1997), The Butterflies of Pamirs: Pl. XXVIII: 14; XXIX: 14; Pl. XLIII: 3 (Ishkashim, Njut).

M. didyma mixta SHELJ.; TSHIKOLOVETS (1997), The Butterflies of Pamirs: Pl. XXVIII: 15; XXIX: 15 (Ishkashimsky Mts., Pish).

M. mixta problematica SHELJ.; TUZOV et al. (2000), Guide to the butterflies of Russia and adjacent territories **2**: 61, Pl. 41: 1-3.

M. mixta nadezhdae SHELJ.; TSHIKOLOVETS (2003), The butterflies of Tajikistan: Pl. LXXII: 9-11, 15 (Holotype), 17 (Paratype), 19-20.

Melitaea m. problematica SHELJ. was described as a form of *M. didyma* (Esp.) We studied the genitalia of the ♂ holotype (col. pl. 3: 3, 4), which is deposited in ZMKU. It is necessary to point out that the genital armature of this specimen is flattened by the previous researcher. Also it is important to note that one paratype specimen from the type series of the taxon *ishkashima* SHELJUZHKO, 1929, which was described on the base of 3 ♂♂ from Ishkashim Mts. (Nyut) is *M. m. problematica* SHELJ. This specimen was figured in TSHIKOLOVETS (1997, 2003) on the plates LXXII, 17 accordingly. The situation with the taxon *ishkashima* SHELJ. was clarified earlier (KOLESNICHENKO, 1999).

TL: Chorog (W Pamirs, Khorog).

♂ (col. pl. 1, 2: 17, 18, 20): Wingspan is the same as in the nominate form, as a whole. UPS ground colour red or orange-red. UPS black pattern thin and delicate, as a rule. Submarginal series represented by pointed lunules, often connected with black marginal border. UPF discal black spots formed by different black macules: the spots situated in central cells are smaller than the spots near the costal and anal edges. UPF often with a pale costal spot. UPH black pattern represented only by marginal border, submarginal lunules and basal suffusion. In some specimens discal series is formed only by one spot near the anal angle. Black basal suffusion of HW poorly developed. UNH pale yellow, as a rule, or white with black veins, as usual. In some specimens (in the holotype also) black veins of UNH are absent. Abdomen without orange scales on the ventral side (in comparison with *M. d. chimaera subspec. nov.*) and ground colour of it is similar to the ground colour of UNH.

♀ (col. pl. 1, 2: 19, 22): UPF ground colour often paler, than in ♂♂, although some specimens have greenish-gray suffusion. Postdiscal series often present besides the usual black pattern. UPS similar to that of the ♂♂. Abdomen without orange scales on the ventral side, as a rule (in comparison with *M. d. chimaera subspec. nov.*), but this feature is weakly expressed in comparison with ♂♂.

♂ genitalia (figs.18-20): Rather variable. Northern populations (Alai Mts., Peter I Mts.) usually have rather large rounded valva (fig.18: A-D) with short (in comparison with *M. d. chimaera subspec. nov.*) and massive caudal process directed downwards and noticeably extended near the base. A few little spines are disposed on the ventral surface of it and a few spines are disposed near the base of caudal process up to the distal apex of valva. In southern populations (Vanch Mts., Ishkashim Mts.) valva (fig.18: G-H) more oval and slightly tapered in the distal part (as in typical *mixta* EVANS). Thin and rather short caudal process is directed downwards. Anterior part of aedeagus (fig.19: A-K) transits to posterior part of it without noticeable prominence on the ventral

surface in the central part. Harpe (figs.20: A-J) often with some pronounced and rather large spines and directed perpendicularly to the plane of valva as it is in the nominate taxon.

♀ genitalia (fig. 21: A-D): ♀♀ of *M. m. problematica* SHELJ. have rather small genitalia, not wide (triangular-shaped); the junction of ductus with antivaginal plate situated over the base of antevaginal plate (in lateral view). Moreover, the fork-shaped sclerotized area of ductus dorsally well defined. Especially, this character is developed in *M. m. problematica* SHELJ. ♀♀ in the populations from Peter I Mts which fly together with *M. d. chimaera subspec. nov.*

Distribution (map 3): West Pamirs (Ishkashim, Khorog, Vanch), Darvaz (Tadzhikobad, Muksu), western part of Alai Valley (including the northern slopes of Transalai Mts. and the southern slopes of Alai Mts.).

Locality list: Shugnansky Mts. (Khorog), Shahdar'insky Mts. (Bodom-Dara, Shobeg r., Badjond-Dara r.), Peter I Mts. (Ganishou, Muk), West Alai Valley (Katta-Karamuk, Darout-Kurgan, Svis r., Kul'duk pass, Kyzyl-Eshme), Vanch Mts. (Vanch, Gushkhon pass), Ishkashimsky Mts. (Ishkashim, Garm-Chashma). HIGGINS (1941) stated Chitral, Gilgit, Drosh and Gazin as distribution area of *M. m. problematica* SHELJ. but this point of view seems to be wrong.

Taxonomic notes: *M. m. problematica* SHELJ. is a variable taxon as individually, as ecologically. The butterflies which inhabits Peter I Mts. (col. pl. 1, 2: 17, 18, 19) fly together with *M. d. chimaera subspec. nov.* (col. pl. 1, 2: 14, 15). The most characteristic external feature of the ♂♂ is the presence of rather developed UNH black scales. UPF black discal band represented by well developed macules, UPS submarginal series well developed and represented by large black lunules (outlined by black scales) connected with marginal black border. UNH ground-colour often yellowish. UPH orange fascia narrow, black pattern more thin and delicate. In the ♀♀ UPS black pattern is more reduced in comparison with the ♀♀ of *M. d. chimaera subspec. nov.* In spite of their some external similarity (which must be the result of climatic/ecological conditions) to *M. d. chimaera subspec. nov.* we regard these specimens as *M. m. problematica* SHELJ. This decision is confirmed by their (*M. d. chimaera subspec. nov.* and *M. mixta problematica* SHELJ.) coexistence in the Peter I Mts. and differences in the ♂ genitalia of both species (figs 14-16 and figs. 18-20, A-D accordingly).

The specimens from the type locality (Shugnansky Mts., Khorog v.) are more or less similar to the butterflies of the nominate form Vanch Mts., Ishkashim Mts. and Peter I Mts. and differ from the nominate ssp. in the absence of UPH black-elbowed fascia and reduced UPS black pattern. It is necessary to point out that the butterflies of the northern population (Alai mts., Darout-Kurgan v.) inhabit the extreme severe conditions and externally look like the specimens from the high altitudes of Shugnansky Mts.

The status of *M. mixta* EVANS figured in SAKAI (1981) is unclear. The specimens from Tera pass (Paktya), Bala-Kuran (NE Hindukush), Koh-i-Baba Mts. (Panjaw) and Panjshir Valley may be regarded as *M. m. problematica* SHELJ. (Pl. 35: 23-26 accordingly).

Ecology and biology: Flies most likely in one brood from the beginning of July in high mountains on 2200-3000 (usually 2200-2700) m.a.s.l. The specimens from the south-eastern part of Alai Mts. were collected up to 3000 m.a.s.l. The biology is unknown. The specimens from Peter I Mt. were collected in more dry and deserted biotopes than *M. d. chimaera subspec. nov.*

Material examined: 251 ♂♂, 115 ♀♀, including 152 dissections.

Melitaea mixta nadezhdae SHELJUZHKO, 1912

M. didyma O.; AVINOV (1910), Hor. Soc. Ent. Ross. 39: 234-235 (Pamirskij Post).

Melitaea didyma O.[CHSENHEIMER] *nadezhdae*, subspec. nov., SHELJUZHKO, 1912, Dt. Ent. Z. Iris 26: 137 (Pamirskij Post).

M. didyma mixta mod. *nadezhdae* SHELJ.; HIGGINS (1941), Trans. Ent. Soc. Lond. 91 (7): 211, Pl. 2: 5, 11.

M. mixta nadezhdae SHELJ.; TUZOV, 1993, The synonymic list of butterflies from the ex-USSR: 47.

M. didyma nadezhdae SHELJ.; Tshikolovets, 1997, The butterflies of Pamir: 118-119, Pl. XXVIII, fig. 2-6; Pl. XXIX, fig. 2-6.

M. mixta nadezhdae SHELJ.; TUZOV et., 2000 Guide to the butterflies of Russia and adjacent territories, Vol. 2: 61.

M. mixta nadezhdae SHELJ.; TSHIKOLOVETS, 2003, The butterflies of Tajikistan, Pl. LXXII, fig. 12-14, 22-23.

The taxon *nadezhdae* SHELJ. was described as a new subspecies on the base of 6 ♂♂ and 4 ♀♀ We studied the type series, which is deposited in ZMKU. All specimens are syntypes. The main part of the type series is labeled "Pamirskij Post". Some type specimens are labeled "Alitshur (Panjir)", "Kyzylj-ar, Pamir c." and "Pamir, Nechisilga".

To conserve the stability of zoological nomenclature, and to avoid further confusion over identification, it is important to have the name-bearing type of *M. didyma nadezhdae* SHELJUZHKO, 1912, fixed by a lectotype designation. The specimen selected for the lectotype is a ♂ deposited in ZMKU with original labels made by SHELJUZHKO. It is the freshest ♂, originating from "Pamirskij Post" (Murgab), i.e. from the center of the Pamirian Plateau, where the *M. mixta* EVANS populations are most uniform.

Lectotype ♂ (col. pl. 3: 5, 6): Lectotype / *M. didyma nadezhdae* SHELJUZHKO, 1912 / design. K. KOLESNICHENKO, S. CHURKIN & R. BERDIEV, 2011. Depository: ZMKU (Ukraine). The label data of the lectotype are as follows: Typus [printed rose label] // *nadezhdae* SHEL., male, "type", Pamirsky Post, VI.09 [SHELJUZKO's hand] // Coll. L. SHELJUZKO [printed label].

Paralectotypes: Some other syntypes labeled by the rose label "Typus" must be considered as paralectotypes, including specimens from other localities ("Kyzylj-ar, Pamir c." and "Pamir, Nechisilga"). Worth to note, that we found only 4 ♂♂ and 3 ♀♀ in ZMKU.

TL: Pamirskij Post (E. Pamirs, Murgab)

♂ (col. pl. 1, 2: 23): Ground colour pale orange. Marginal black border often fine. Submarginal lunules delicate, sometimes fused with marginal black border. UPF discal series reduced between veins 2-4. UPH discal series absent, as a rule. UPF with a pale costal spot. UNF black pattern often reduced. UNH veins sometimes indicated by black scales. UNH orange fascia thin and delicate, orange macules of this fascia often edged with black scales.

♀ (col. pl. 1, 2: 24): Ground colour yellowish-orange with yellowish costal border. UNH similar to the ♂.

♂ genitalia (figs. 22-24): Valva (fig.22: A-D): Oval and rather narrow. It is slightly tapered in the distal part. A few small spines are disposed on the ventral surface of it and a few spines are disposed near the base of caudal process up to the distal apex of valva. Thin and rather short caudal process is directed downwards and noticeably extended near the base. Aedeagus (fig.23: A-D) sometimes with a small prominence on the ventral surface in the central part, between its anterior and posterior parts. Harpe (fig. 24: A-C) narrow, with small spines and is directed perpendicularly to the plane of valva as it is in the nominate taxon.

♀ genitalia (fig. 21: E): Similar to those of *M. m. problematica* SHELJ., but smaller.

Distribution (map 3): East Pamirs Plateau. The north-western limits include the vicinity of Sarez Lake, Jashil'kul' Lake and Sarykol Mts.

Locality list: Bulun-Kul' L., Murgab t., Kyzyljar v., Tokuz-Bulak, Iashil'-Kul' L., S. Alichursky Mts. (Tagarkatty-Kuruk v.), North

Alichursky Mts. (Sassyk-Kul'), Rushansky Mts. (L'angar, Irht), Sarykolsky Mts. (Dunkel'dyk lake), Mynhadzhir Mts.

Taxonomic notes: This is the smallest form of *M. mixta* EVANS with pale UPS ground colour and partly reduced black pattern (like the other taxa of high mountain *Melitaea*-forms). Moreover, the ♀♀ without UPS greenish-gray suffusion (looking like ♂ specimens). The population from the Central Pamirs (the vicinity of Sarez lake) has some external differences. This is the smallest form of *M. mixta* EVANS with somewhat deleted UPH pattern (this feature seem to be an ecological reaction on extreme severe of habitat). It is necessary to point out that the butterflies from East Pamirs are sometimes without UNH black veins, but the statistics is not great.

We believe that the specimens from the southern slopes of Sarykol Mts. undoubtedly belong to *M. m. nadezhdae* SHELJ., but they have some similarity to *M. m. problematica* SHELJ., with partial reduction of UPS black pattern. The same situation is known for *M. fergana* STGR. (CHURKIN & TUZOV, 2000).

The ♂ specimen of *M. mixta* EVANS figured in SAKAI (1981) from Afghanistan (Issyk Valley, Wakhan) may be attributed to *M. m. nadezhdae* SHELJ. by the external features.

Ecology and biology: Flies in one generation from the end of June till the beginning of August up to 3800-4400 m. Biology unknown.

Material examined: 74 ♂♂, 35 ♀♀, including 50 dissections.

Discussion: *Melitaea didyma* (Esp.) is widely distributed over the whole mountain region and the adjacent plains of the «Russian» Central Asia. This species inhabits territories with extremely various environmental conditions: from desert and semi-desert foothills of Tian-Shan and South Ghissar to the subalpine zone of Peter I Mts., but shows ecological preference to more arid habitats. Study of the ♂ genitalia shows that each taxon within *M. didyma* (Esp.), in spite of a great variability, has individual characters. On the other hand, the differences in the structure of ♂ genital armature are not reliable. Moreover, intermediate forms seem to exist at the borders of the distribution area of each form.

We can suppose that *M. didyma* (Esp.) has spread into the «Russian» Central Asia by two ways [taking into consideration that *M. didyma* (Esp.) is a West Palaearctic species]: first, from the southern Urals and western Siberia across the middle altitudes of Altai, through Saur and Tarbagatai Mts. to Dzhungar Ala-Tau Mts., and only from there to Tian-Shan. Nevertheless, the morphological similarity of populations could be traced only until the middle altitudes of Saur and eastern Tarbagatai Mts. (in our opinion, they belong to the nominate subspecies⁵). The morphological similarity of *M. didyma* (Esp.) inhabiting Saur and Tarbagatai Mts., from one side, and Altai, from another, seems to verify the existence of the connection between the populations in question in the recent past. Also, we have found a small series of *M. didyma* (Esp.) (ZISP coll.), externally very similar to *M. d. ambra* HIGGINS collected in sandy habitats in the vicinity of Kal'dzhir (East Kazakhstan), and somewhat similar specimens were found in the Zaisan depression (Kinderlik). The penetration of *M. d. ambra* HIGGINS in those regions apparently happened from the south. In the Dzhungar mountain system only *M. d. ambra* HIGGINS can be found. From the northern slopes of Dzhungar Ala-Tau Mts., *M. didyma* (Esp.) is known only from desertified low hills and is evidently very rare. Externally, these specimens show a similarity to *M. d. ambra* HIGGINS. In the southern part of the Dzhungar mountain system (Burhansary-Tau Mts. and so on) *M. didyma* (Esp.) inhabits higher (up to 2000 m over the sea level) altitudes and contains morphological features of ♂♂ and ♀♀ of real *M. d. ambra* HIGGINS. In the region of Chu-Ili Rivers Valley only *M. d. ambra* HIGGINS can be found. Apparently, in connection with the above listed facts, the second pathway of *M. didyma* (Esp.) penetration to the «Russian» Central Asia: over deserts and semi-deserts of the northern Uzbekistan and southern Kazakhstan is possible. As it was mentioned above, we collected and found in ZISP a series of *M. didyma* (Esp.) from the deserts of the southern Kazakhstan («Bolshie Barsuki» sands, Kazalinsk village and vicinities of Kyzyl-Orda). Externally, there are very much similar to *M. d. ambra* HIGGINS due to UPS sand-yellow ground colour. *M. didyma* (Esp.) penetrates Karakalpakia along Aral Sea, already as a typical *M. d. ambra* HIGGINS. Further, the habitats suitable for *M. didyma* (Esp.) spread to the east along the Syr-Darja river to Dzhungarskiy Ala-Tau Mts. over Kara-Tau Mts. (where in the vicinity of Kentau village the specimens of *M. didyma* (Esp.) have all external features similar to *M. d. ambra* HIGGINS, particularly yellowish ground colour) and desertified areas of Chu-Ili Valley. Furthermore, the habitats of *M. d. ambra* HIGGINS seem to cover the region from Karakalpakia and along Amu-Darja River to the south-east up to the southern Ghissar Mts. and western Zeravshan Mts. where this form hybridizes with *M. d. turkestanica* SHELJ., producing a slightly different form.

As mentioned above, *M. d. ambra* HIGGINS also penetrates the inner valleys of Tian-Shan: to the western vicinities of Issyk-Kul Lake and to Orto-Tokoi Lake through the dry Boom Valley, where it was described as ssp. *manoni* HANUS. At the first glance, the appearance of the desert form of *M. didyma* (Esp.) within the Tian-Shan mountain system arouses amazement (the eastern part of the Issyk-Kul Depression (Pokrovka v.) is inhabited by typical *M. d. turkestanica* SHELJ.). However, it is necessary to point out that the western part of the Issyk-Kul Depression is extremely arid with minimal annual rainfall in the whole Tian-Shan. This exactly circumstance, from our point of view, allows the desert form *M. d. ambra* HIGGINS to penetrate deeply into the mountain areas. It is important to mark that in numerous extremely arid valleys of Tian-Shan we collected intermediate forms between *M. d. ambra* HIGGINS and *M. d. turkestanica* SHELJ. However, it is necessary to underline that the wingspan of the described forms of *M. didyma* (Esp.) is significantly larger and, as a rule, there is a distinct grey suffusion on the ♀ FW. We do not exclude the specific status of *M. d. ambra* HIGGINS. Indirectly, this assumption being supported by the fact that at the borders of *M. d. ambra* HIGGINS habitat the external features have maximum external differences in comparison with *M. d. turkestanica* SHELJ., if the contact with the last form is possible. According to the genitalia structure, *M. d. ambra* HIGGINS is the most isolated subspecies of *M. didyma* (Esp.). Generally, valva is small, more round than oval. Caudal projection short-cut, caudal border with a small number of teeth. Aedeagus distally tapered and noticeably extended in the middle. The most characteristic detail of this taxon is the harpe structure. It is narrow with small number of weakly expressed teeth (this feature is the most distinctive for butterflies occurring in the vicinity of Orto-Tokoi Reservoir, SW shore of Issyk-Kul Lake and the desert areas of Ili River).

Taking into account external and genital features we refer the specimens from Kunges (ex. coll. ZIN) to *M. d. ambra* HIGGINS although harpe (as a primary indication) has an obvious dilation in the middle. As a whole, the genitalia of *M. didyma* (Esp.) from

⁵ Some authors (LUKHTANOV & LUKHTANOV, 1994) attributed the name *neera* FISCHER DE WALDHEIM, to the specimens of *M. didyma* (Esp.) from West Siberia.

the northern slopes of Dzhungarskiy Ala-Tau Mts. (Koktuma) resemble those of *M. d. ambra* HIGGINS.

According to the genitalia structure, the butterflies inhabiting semi-desert habitats of Bishkek suburbs have a tendency to a transition to the taxon *M. d. turkestanica* SHELJ.: valva is obviously oval, relatively large with relatively large number of teeth on the caudal border, aedeagus elegant and elongated, the shape of harpe is typical for *M. d. turkestanica* SHELJ.

Thus, it may be assumed that the natural habitat of *M. d. ambra* HIGGINS covers all desert foothills of Tian-Shan, and over the northern slopes of Dzhungar Ala-Tau Mts. reaches Boro-Horo Mts. The easternmost known locality of the typical *M. d. ambra* HIGGINS is the desert of Dzhungar Gobi (Mongolia, SW Altai). Such a finding of the Turanian butterflies may be astonishing, but it is known that the Turan fauna actively penetrates the SW slopes of the Mongolian Altai (YAKOVLEV, 2004). Moreover, botanists (RACHKOVSKAYA, 1993; KAMELIN, 1998) consider this area as belonging to the Dzungar Province of the Turan botanical Subregion. The ability of *M. didyma* (ESP.) to inhabit badlands may be explained by rather wide polyphagy of this species (KOLESNICHENKO, 2007). We identified the food-plant of *M. didyma* (ESP.) in the sandy deserts of "Bolshie Barsuki" in the western part of the Aral Sea, which proved to be *Artemisia* sp., one of the few desert plants. Apparently, such a shift in larval feeding from the families Scrophulariaceae, Lamiaceae and Plantaginaceae has an adaptive base.

Melitaea d. carminea **subspec. nov.** is externally rather different from *M. d. turkestanica* SHELJ. and is distributed over the western Tian-Shan. The most typical region for this subspecies includes mountain valleys of Chatkal and Pskem Rivers, and along the Chatkal Ridge the distribution of *M. d. carminea* ssp. n. stretches up to Kuraminskiy Mts. It is well known that the western Tian-Shan is the most isolated part of the Tian-Shan Mountain system. Some of widespread Central Asian species produce well-differentiated subspecies in this region, like *M. d. carminea* **subspec. nov.** In this case, intermediate specimens occur at the northern slopes of Talas Mts (it is necessary to point out that intermediate forms occur in Talas Mts., representing hybrids between the real *M. d. carminea* **subspec. nov.** and *M. d. ambra* HIGGINS (as it was stated before, the Talas Valley is inhabited by *M. d. ambra* HIGGINS) and at the south-eastern slopes of Chatkal Mts. (where the hybrids between *M. d. turkestanica* SHELJ. and *M. d. carminea* **subspec. nov.** occur). However, the north-eastern slopes of Chatkal Mts. (Padsha-Ata River) are inhabited by the typical *M. d. turkestanica* SHELJ., which penetrates there, possibly coming around the Toktogul Depression from the north. Interesting, that the features of the ♂ genitalia of these butterflies are more similar to *M. d. carminea* **subspec. nov.** (caudal border without a bun of spines near the apex, wide harpe with a small number of teeth). *Melitaea d. carminea* **subspec. nov.** is characterized by rather large valves but the number of teeth on the caudal border is less or they are absent, caudal distal projection, even more massive than in *M. d. turkestanica* SHELJ. (with an exception of the specimens from Kuramin Mts.), massive aedeagus is not dilated in the middle (more slender than in *M. d. turkestanica* SHELJ.). Caudal distal projection in the specimens from SE slopes of Chatkal Mts. become less massive, number of teeth on the caudal border increases. The harpe has a shape typical for *M. d. carminea* **subspec. nov.** The specimens examined from the Sumsar locality have aedeagus dilated in the middle.

Undoubtedly, Chatkal Range and the northern slopes of Talas Mts. represent a natural barrier between the mentioned subspecies, and the narrow zone of hybridization is situated there.

As it was pointed out above, *M. d. turkestanica* SHELJ. from East Alai and Fergansky Mts. is the most large and typical one. These butterflies have an obvious external similarity to the populations from Inner Tian-Shan. In our opinion, the main gene exchange path runs along the valleys of Naryn River (in case of interconnections between Fergansky Mts. and Inner Tian-Shan) and along Kokomeren River (in case of interconnections between southern slopes of Kyrgyzskiy Mts. and the eastern slopes of Suusamy Mts.). The isolated part of *M. d. turkestanica* SHELJ. is distributed in the Ghissar mountain system where the specimens are somewhat different externally and combine the features of *M. d. ambra* SHELJ. This form was described as *elavar* FRUHST. However, the final status of *elavar* FRUHST. needs further clarification. Perhaps, the phenotypic similarity in a part of the population from Ghissar Mts. to *M. d. ambra* HIGGINS was formed only by the ecological conditions. The paler UPF colour of the ♂♂ and especially of the ♀♀ from Ghissar Mts. may be the result of a rather dry climate. However, we cannot exclude the influence of the desert *M. d. ambra* HIGGINS which is distributed in Karakalpakia and seems to penetrate the foothills of W Ghissar along Amu-Darja river.⁶ *Melitaea d. turkestanica* SHELJ. has the largest ♂ genitalia: large oval valva with prominent and reinforced basally caudal process, caudal border with a pronounced row of small teeth (bun of teeth especially well-defined in the distal part of caudal border). Harpe is more extended in dorso-ventral direction, generally has rather strong teeth, becomes more massive in the distal part. Specimens from Ghissar Mts., as a rule, have more elegant harpe with less pronounced teeth. Moreover, these specimens (especially from the southern slopes of Ghissar Mts.) have more elongated valva and show a tendency to *M. d. chimaera* **subspec. nov.** Aedeagus rather large, dilated in the middle, caudal elongated border is strongly curved.

Peter I Mts. is inhabited by *M. d. chimaera* **subspec. nov.** Similar butterflies were collected in the western part of Transalai Mts. (in the vicinity of Darout-Kurgan, Aram-Kungei and Kyzyl-Eshme), southern slopes of Ghissar Mts. (Varzob r. and Karatag r.) and Hazretisho Mts. The areas of *M. d. chimaera* **subspec. nov.** and *M. m. problematica* SHELJ., come in contact in the mentioned region. As it was mentioned above, the populations of *M. d. chimaera* **subspec. nov.** have well marked UPS submarginal lunules (like *M. mixta* EVANS), which could confuse and force many researchers to give the taxon *mixta* EVANS a subspecific status of *M. didyma* (ESP.) (HIGGINS, 1941, and others) and evidence about the transitional status of the specimens from Peter I Mts. between the *M. d. turkestanica* SHELJ. *M. m. problematica* SHELJ. The differences in the genital structure and in the external features in the mentioned taxa exclude the subspecies status of the taxon *mixta* EVANS. It is necessary to note that the external difference between *M. m. problematica* SHELJ. and *M. d. chimaera* **subspec. nov.** also consists in the wing pattern. *Melitaea m. problematica* SHELJ. has UNH ground colour yellowish with veins indicated by black scales (with rare exceptions), while in *M. d. chimaera* **subspec. nov.** black suffusion along the veins is absent. This feature is strongly noticeable in the conditions of joint habitation of two species. As a whole, *M. d. chimaera* **subspec. nov.** is a divergent form which inhabits the boundary of the distribution of *M. didyma* (ESP.) in Central Asia.

⁶ The idea about influence of the deserted *M. d. ambra* HIGGINS to the populations of *M. didyma* (ESP.) inhabiting Ghissar Range is a hypothesis only. We not found any specimens originated from Amu-Darja R. in studied collections. But it is necessary to point out that 3 ♂♂ at our disposal of *M. didyma* (ESP.) from Nuratau Mts. (situated near Amu-Darja r. valley) looks like the desert *M. d. ambra* HIGGINS (small size, thin and delicate black pattern and yellowish ground color). In a certain case this material confirms our supposition about the penetration of *M. d. ambra* HIGGINS to the Ghissar Mts.

Melitaea mixta EVANS is represented by 3 subspecies in the mountains of the «Russian» Central Asia and adjacent territories. It is necessary to emphasize, that intraspecific variability of *M. mixta* EVANS often exceeds its geographical variability, making difficulties in separating the subspecies. Furthermore, the hiatus between the nominate taxon and *M. m. problematica* SHELJ. is less expressed than between *M. m. mixta* EVANS and *M. m. nadezhdae* SHELJ. (this fact has been already pointed out by HIGGINS).

The external differences of *M. m. nadezhdae* SHELJ. indicate the isolation of these populations and confirm the hypothesis that the Pakistanian nominate *M. mixta* EVANS does not directly penetrate the East Pamirs: this territory is occupied by *M. m. problematica* SHELJ. coming from the West Pamirs (an intermediate form between the two mentioned subspecies was found in the vicinities of Sarykol Mts.). The populations of *M. m. nadezhdae* SHELJ. distinguished in the different parts of area having the stable features inside the population at the same time. The Sarez Lake population of *M. m. nadezhdae* SHELJ. may be considered as the most isolated.

The southern part of the distribution of *M. mixta* EVANS is unknown. We do not exclude the possibility of occurrence of this species in the NE India (Kashmir). However, this question remains open at present and needs further study.

We have studied the genital structures of all taxa belonging to *M. mixta* EVANS from different localities. Unfortunately, there is only one specimen of the typical *M. mixta* EVANS (Shandur pass) at our disposal. Valva is relatively small, more or less oval, slightly elongated distally, caudal border has some small teeth. Aedeagus is rather short that readily distinguishes *M. mixta* EVANS from the other taxa of the *M. didyma* (Esp.)-group. Harpe is short and gently dilated in the middle. The genitalia of the butterflies from the type locality of *M. m. problematica* SHELJ. (Chorog) are highly similar to those of the typical *M. mixta* EVANS. A great variability, especially in the valval structure, is typical for more northern populations, which are characterized by oval valvae with a large number of small teeth on the caudal process. In the southern populations valva is oval and resembles that of the nominate subspecies and *M. m. nadezhdae* SHELJ. The last taxon is characterized by a thin harpe.

In conclusion, we can summarize that *M. mixta* EVANS and *M. didyma* (Esp.) have been isolated in the recent past. Both species are quite similar in external features and genital structure, and occur in arid biotopes. *Melitaea didyma* (Esp.) in the «Russian» Central Asia has adapted to live in the plains and middle attitudes and do not demonstrate any clear dependence on the type of a xerophytic biotope, while *M. mixta* EVANS is a high altitude species occurring in the Pamirs with the most pronounced xerothermic conditions.

Acknowledgements: We would like to express our gratitude to the following persons for giving to us the opportunity to examine their collections: A. V. SVIRIDOV (ZMMU), A. L. LVOVSKY (ZISP), A. L. DEVYATKIN (Moscow State University), G. D. SAMODUROV, A. ZAMESOV (Moscow), I. G. PLJUSTCH (Kiev).

References

- AVINOV, A. N. (1910): Contributions a la faune des Rhopaloceres du Pamirs oriental. - Horae Soc. Ent. Ross. **39**: 225-246, Tabl. XIV, Moscow.
- ALPHERAKY, S. (1881): Lépidoptères du district de Kuldja et des montagnes environnantes. Part I. Rhopalocères. - Horae Soc. Ent. Ross. **16** (3-4): 334-435, pls. 14, 15, Moscow.
- BRAMSON, K. L. (1910): Analytische Übersicht der Formen von *Melitaea didyma* O. - Horae Soc. Ent. Ross. **39**: 359-390, Moscow.
- BRYK, F. (1940): Geographische Variabilität von *Melitaea didyma* (ESPER). - STRAND'S "Folia Zoologica et Hydrobiologica" **10** (2): 293-353, Taf. II-VI, Riga.
- CHURKIN, S. V. & V. K. TUZOV, V.K. (2000): Revision of *Melitaea fergana* STAUDINGER, 1882 (Lepidoptera, Nymphalidae). - Helios **1**: 33-60, Figs. 1-7, Moscow.
- EVANS, W. H. (1912): A list of Indian Butterflies. - J. Bombay Nat. Hist. Soc. **21** (2-3): 553-584, 969-1008, Bombay.
- EVANS, W. H. (1932): The identification of Indian Butterflies. Second edition revised. - Publ. Bomb. Nat. Hist. Soc.:10 + 454. Pl. I + XXXII, Madras, print. Diocesan Press. .
- FRUHSTORFER, H. (1917): Neue Rhopaloceren aus der Sammlung LEONHARD. - Archiv für Naturgeschichte (1916) **82** (A)(2): 1-28, Taf. 1, Berlin.
- GROUM-GRSHIMAILO, GR. (1890): Le Pamirs et sa faune lepidopterologique. In: ROMANOFF, N. M. (Red.). - Memories sur les Lepidopteres **4**: 17+575+2, Pl. A, 1-21, carte, St.-Petersbourg.
- GROUM-GRSHIMAILO, GR. (1896): Opisanie puteshestviya v Zapadnyi Kitai. Vdol' Vostochnogo Tian-Shanja I. [A description of a journey to West-China. Along Eastern Tien-Schan]: 1- 547, 26 ills., 1 map. - St-Petersbourg.
- ICZN (1999): International Code of Zoological Nomenclature, fourth edition. - London (International Trust of Zoological Nomenclature).
- KAMELIN, R. V. (1998): Materials on the history of flora of Asia (Altai Mountain country). - Barnaul [in Russian].
- KOLESNICHENKO, K. A. (1999): A review of the East-Palaearctic taxa of the *Melitaea didyma* (ESPER, [1779])-group. 1. The *M. ala* STAUDINGER, 1881 - *M. chitralensis* MOORE, 1901-complex. - Atalanta **30** (1/4): 87-117, Colour plates VI-VII, Würzburg.
- KOLESNICHENKO, K. A. (2007): A review of taxonomy and ecology of the butterflies of the genus *Melitaea* (Lepidoptera, Nymphalidae). - Bulletin of Moscow Society of naturalists. Biological series **112** (3): 27-37, Moscow (in Russian).
- KOLESNICHENKO, K. A. & S. V. CHURKIN (2003): A review of the *Melitaea minerva* STAUDINGER, 1881 species-group (Lepidoptera, Nymphalidae). - Helios **4**: 301-341, Col. plates. XIV-XVI, Moscow.
- KOLESNICHENKO, K. A. & S. V. CHURKIN (2004): Taxonomic notes on *Melitaea didymina* STAUDINGER, 1895 (Lepidoptera, Nymphalidae). - Helios **5**: 91-100, Colour plate V:13-18, Moscow.
- KORSHUNOV, YU. P. (1972): Каталог булавоусых чешуекрылых (Lepidoptera, Rhopalocera) фауны СССР. [Catalogue of Butterflies (Lepidoptera, Rhopalocera) of USSR-fauna.]. - Энт. Обзор. [Ent. Obozr.] **51** (2): 352-368, Moscow [in Russian].
- HANUS, J. (1996): New butterfly taxa from Kyrgyzstan (Lepidoptera, Rhopalocera). - Atalanta **27** (1/2): 203-210, Pl. III-IV, Würzburg.
- HIGGINS, L. G. (1941): An illustrated catalogue of the palaearctic *Melitaea* (Lepidoptera, Rhopalocera). - Trans. Ent. Soc. Lond. **91** (7): 175-365, 16 pls., 215 figs., London.
- HIGGINS, L. G. (1955): A descriptive catalogue of the genus *Mellicta* BILLBERG (Lepidoptera, Nymphalidae) and its species, with supplementary notes on the genera *Melitaea* and *Euphydryas*. - Trans. R. Ent. Soc. Lond. **106**:131 pp., 2 pls., London.

- HIGGINS, L. G. (1981): A revision of *Phyciodes* HÜBNER and related genera, with a review of the classification of the Melitaeinae (Lepidoptera: Nymphalidae). - Bull. Brit. Mus. Nat. Hist. Ent. **43** (3): 77-243, fig. 1-490, London.
- LUKHTANOV V. & A. LUKHTANOV (1994): Die Tagfalter Nordwestasiens (Lepidoptera, Diurna). - Herbiopoliana **3**, Verlag Eitschberger, Marktleuthen.
- OBERTHÜR, CH. (1909): Notes pour servir à établir la faune française et algérienne des Lépidoptères. - Etud. Lép. Comp. **3**: 101-104. Tab. 11, 16-20, 23-26, Compiègne.
- RACHKOVSKAYA, E. I. (1993): Rastitel'nost' Gobiiskih pustyn' Mongolii: 1-133, St.-Petersburg [in Russian].
- RÜHL F. & A. HEYNE (1895): Die paläarktischen Großschmetterlinge und ihre Naturgeschichte: 1-857. - Leipzig.
- SAKAI, S., (1981): Butterflies of Afghanistan: 1-272, Pl. 1-48. - Kodansha, Tokyo [Japanese].
- SEITZ, A. (1906-1910): Die Groß-Schmetterlinge des Paläarktischen Faunengebietes. Die Paläarktischen Tagfalter **1**. - Lehmann, Stuttgart.
- SHELJUZHKO, L. (1912): Eine neue Form von *Melitaea didyma*, O. - Dt. Ent. Z. Iris **26**: 137-138, Dresden.
- SHELJUZHKO, L. (1929): Einige neue palaearktische Lepidopteren-Formen. - Mitt. Münch. Ent. Ges. **19** (10-12): 347-362, Taf. XXVII, München.
- STAUDINGER, O. (1886): Centralasiatische Lepidopteren. - Stettin. Ent. Z. **47**: 193-215, 225-256, Stettin.
- STAUDINGER O. & H. REBEL (1901): Catalog der Lepidopteren des palaearktischen Faunengebietes. **1**: Papilionidae-Hepialidae. - Friedländer & Sohn, Berlin.
- TSHIKOLOVETS, V. V. (1997): The butterflies of Pamir. - Publ. F. Slamka Bratislava.
- TSHIKOLOVETS, V. V. (2003): Butterflies of Tadjikistan. - Kyiv-Brno.
- TUZOV, V. K. (1993): The synonymic list of butterflies from the ex-USSR. - Rosagroservice, Moscow.
- TUZOV, V. K., BOGDANOV, P. V., CHURKIN, S. V., DEVYATKIN, A. L., DANCHENKO A. V., SAMODUROV, G. D. & A. B. ZHDANKO (2000): Guide to the butterflies of Russia and adjacent territories **2**. - Pensoft, Sofia-Moscow.
- WAGNER, F. (1913): Beitrag zur Lepidopterefauna des Ilgebietes sowie des Sary-Dschas (Asia centr.). - Ent. Mitt. **2** (3): 22-30, 50-62, 88-95, 112-126, 153-158, 185-190, 244-254, 285-288, Berlin.
- YAKOVLEV, R. (2004): New data on the taxonomy of the Mongolian Rhopalocera (Lepidoptera). - Helios **5**: 221-231, Col. Pls. XIV: 1-6, XV: 1-6, Moscow.

Addresses of the authors

KIRILL A. KOLESNICHENKO
Leninskie Gory, 119991,
Lomonosov Moscow State University,
Botanical Garden
kkolesnichenko@gmail.ru

SERGEI V. CHURKIN
Jubileinyi pr., 14-168
Reutov, 143952, Moscow reg., Russia
serghelios2007@yahoo.com

RUSTAM K. BERDIEV
Leninskie Gory, 1-12, 119991,
Lomonosov Moscow State University,
Faculty of Biology, Dept. Human and Animal Physiology
rberdiev@gmail.com

Fig. 1

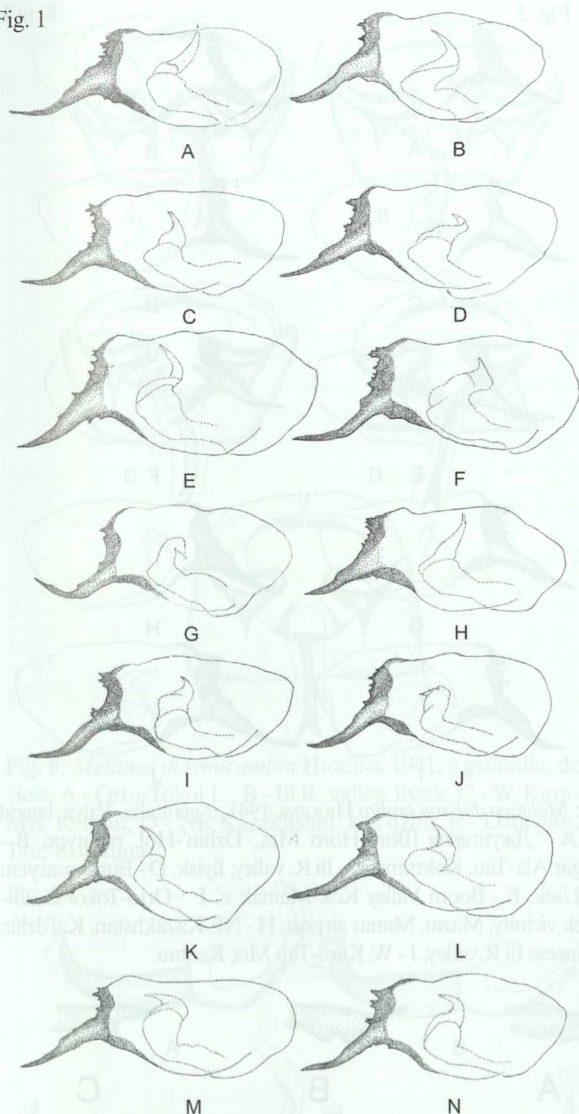


Fig. 1: *Melitaea didyma turkestanica* SHELJUZHKO, 1929, ♂ genitalia. Valva, lateral view: A - Fergansky Mts., Kara-Su L., B - Alai Mts., Tar r., C - Alai Mts., Chauvai r., D - Moldo-Too Mts., Kurtka r., E - Naryn t. vicinity, Ak-Tal v., F - Kokomeren r., Kyzyl-Oi v., G - Terskei Ala-Tau Mts., Pokrovka v., H - Kara-Kul' t. vicinity, I - Dzhahalal-Abad t. vicinity, J - Chatkal Mts., Padsha-Ata r., K - Kulja, Kunges, L - Turkestansky Mts., Matcha, M - Fanskye Mts., Madovra v., N - W Ghissar Mts., Tash-Kurgan v.

Fig. 2

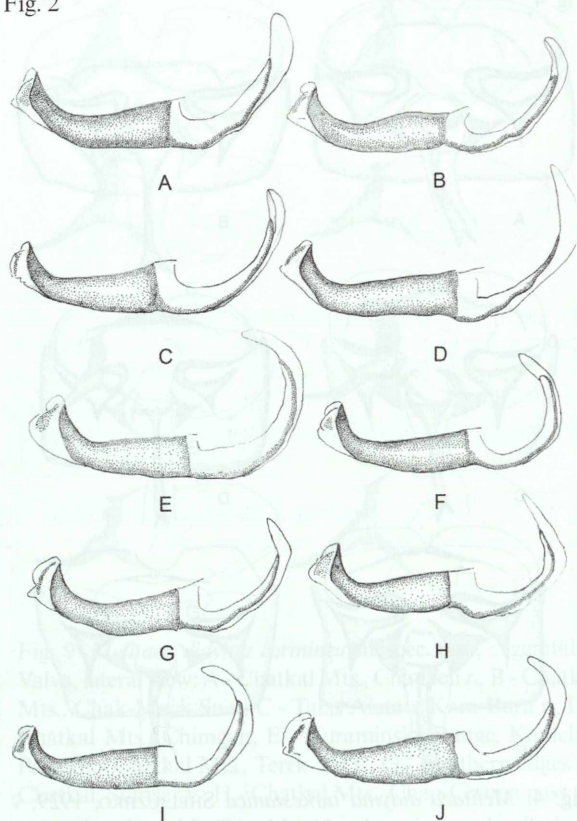


Fig. 2: *Melitaea didyma turkestanica* SHELJUZHKO, 1929, ♂ genitalia. Aedeagus, lateral view: A - Fergansky Mts., Kara-Su L., B - Alai Mts., Tar r., C - Moldo-Too Mts., Kurtka r., D - Naryn t. vicinity, Ak-Tal v., E - Terskei Ala-Tau Mts., Pokrovka v., F - Chatkal Mts., Padsha-Ata r., G - Turkestansky Mts., Matcha, H - Kulja, Kunges, I - W Ghissar Mts., Tash-Kurgan v., J - Fanskye Mts., Madovra v.

Fig. 3

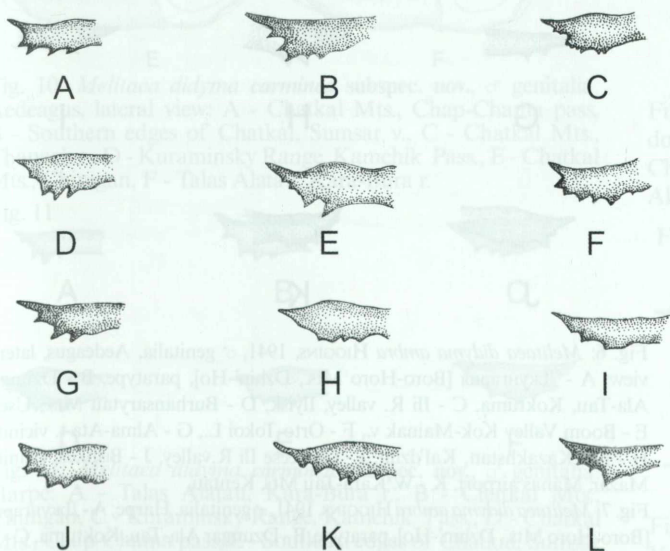


Fig. 3: *Melitaea didyma turkestanica* SHELJUZHKO, 1929, ♂ genitalia. Harpe: A - Terskei Ala-Tau Mts., Pokrovka v., B - Kokomeren r., Kyzyl-Oi v., C - Moldo-Too Mts., Kurtka r., D - Fergansky Mts., Kara-Su L., E - Naryn t. vicinity, Ak-Tal v., F - Chatkal Mts., Padsha-Ata r., G - Fergansky Mts., Kara-Su L., H - Alai Mts., Chauvai r., I - Turkestansky Mts., Matcha, J - W Ghissar Mts., Tash-Kurgan v., K - Fanskye Mts., Madovra v., L - Kulja, Kunges.

Fig. 4

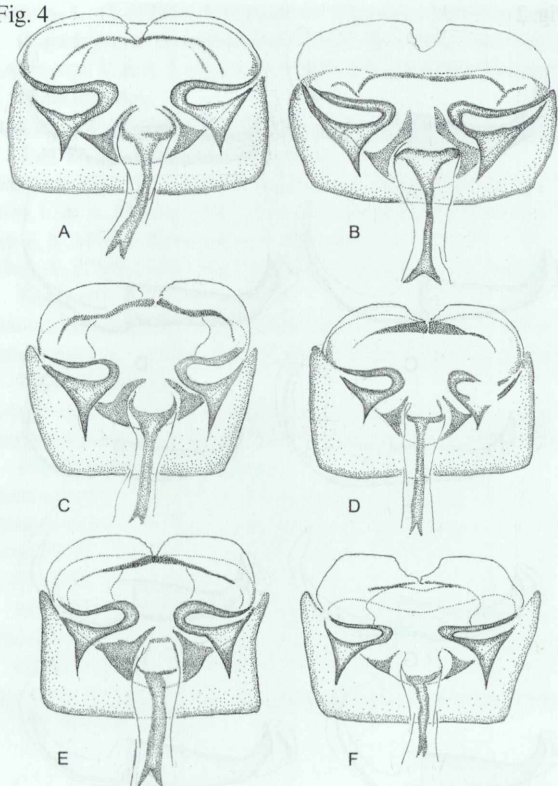
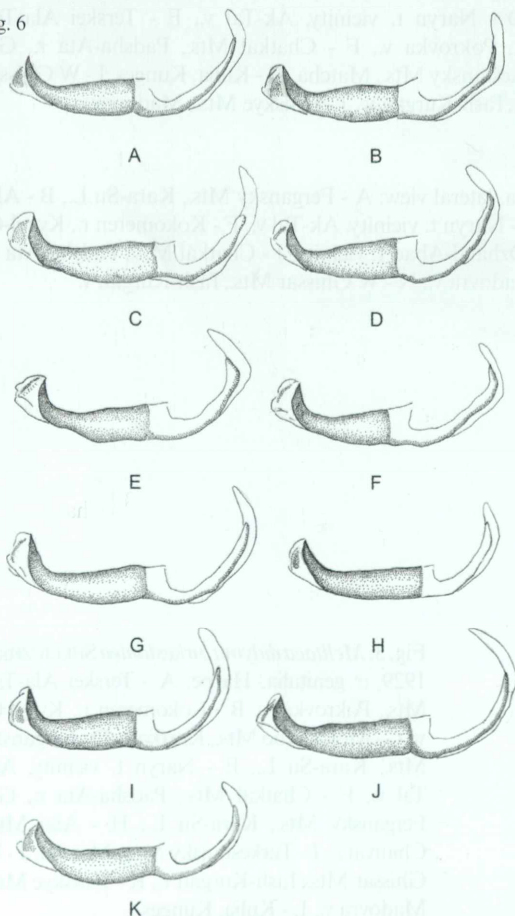


Fig. 4: *Melitaea didyma turkestanica* SHELJUZHKO, 1929, ♀ genitalia, dorsal view: A - Alai Mts., Shahimardan, B - Alai Mts., Tar r., C - Moldo-Too Mts., Kurtka r., D - Kokomeren r., Kyzyl-Oi v., E - Tash-Kumyr t. vicinity, F - W Ghissar Mts., Tash-Kurgan v.

Fig. 6



R. valley, Ilyisk, D - Burhansarytau Mts., Usek, E - Boom Valley Kok-Mainak v., F - Orto-Tokoi L., G - Alma-Ata t. vicinity, H - NE Kazakhstan, Kal'dzhir, I - Chinese Ili R. valley, J - W. Kara-Tau Mts, Kentau, K - Bishkek vicinity, Mazar, Manas airport.

Fig. 5

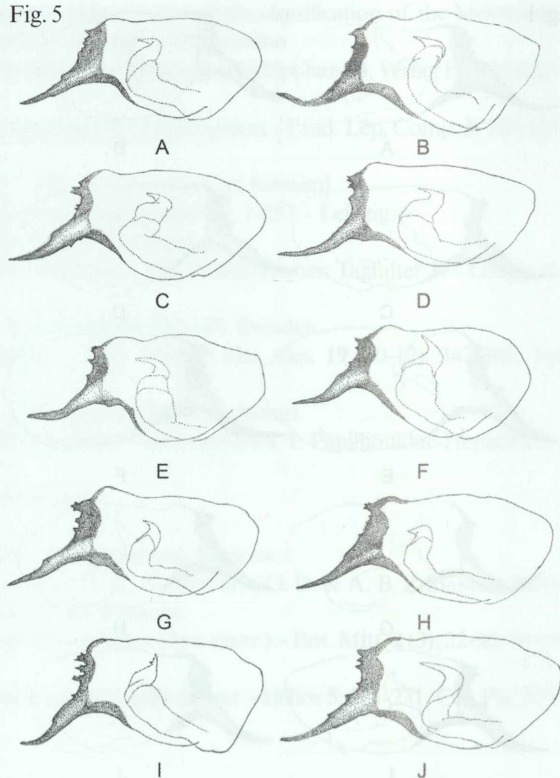


Fig. 5: *Melitaea didyma ambra* HIGGINS, 1941, ♂ genitalia. Valva, lateral view: A - Джунгария [Boro-Horo Mts., Dzhin'-Ho], paratype, B - Dzungar Ala-Tau, Koktuma, C - Ili R. valley, Ilyisk, D - Burhansarytau Mts., Usek, E - Boom Valley Kok-Mainak v., F - Orto-Tokoi L., G - Bishkek vicinity, Mazar, Manas airport, H - NE Kazakhstan, Kal'dzhir, I - Chinese Ili R. valley, J - W. Kara-Tau Mts, Kentau.

Fig. 7

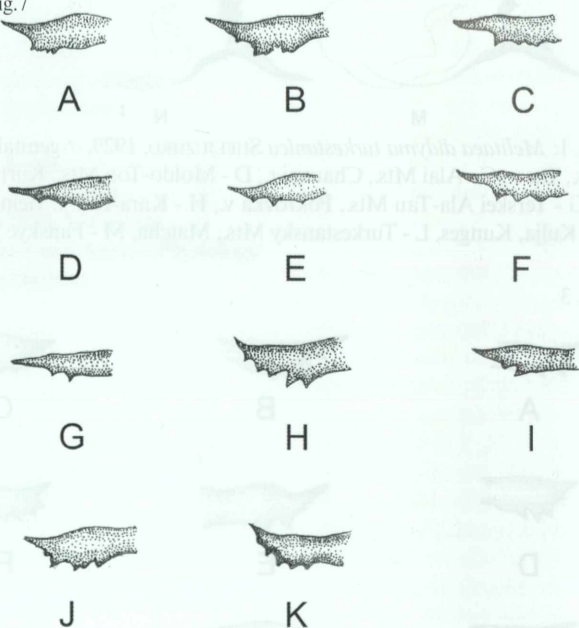


Fig. 6: *Melitaea didyma ambra* HIGGINS, 1941, ♂ genitalia. Aedeagus, lateral view: A - Джунгария [Boro-Horo Mts., Dzhin'-Ho], paratype, B - Dzungar Ala-Tau, Koktuma, C - Ili R. valley, Ilyisk, D - Burhansarytau Mts., Usek, E - Boom Valley Kok-Mainak v., F - Orto-Tokoi L., G - Alma-Ata t. vicinity, H - NE Kazakhstan, Kal'dzhir, I - Chinese Ili R. valley, J - Bishkek vicinity, Mazar, Manas airport, K - W. Kara-Tau Mts, Kentau.

Fig. 7: *Melitaea didyma ambra* HIGGINS, 1941, ♂ genitalia. Harpe: A - Джунгария [Boro-Horo Mts., Dzhin'-Ho], paratype, B - Dzungar Ala-Tau, Koktuma, C - Ili R. valley, Ilyisk, D - Burhansarytau Mts., Usek, E - Boom Valley Kok-Mainak v., F - Orto-Tokoi L., G - Alma-Ata t. vicinity, H - NE Kazakhstan, Kal'dzhir, I - Chinese Ili R. valley, J - W. Kara-Tau Mts, Kentau, K - Bishkek vicinity, Mazar, Manas airport.

Fig. 8

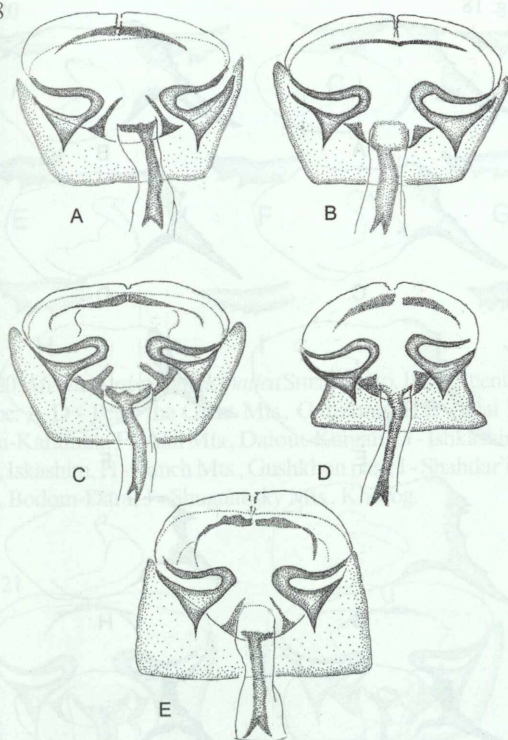


Fig. 8: *Melitaea didyma ambra* HIGGINS, 1941, ♀ genitalia, dorsal view: A - Orto-Tokoi L., B - Ili R. valley, Ilyisk, C - W. Kara-Tau Mts, Kentau, D - NE Kazakhstan, Kal'dzhir, E - Dzungar Ala-Tau, Koktuma.

Fig. 10

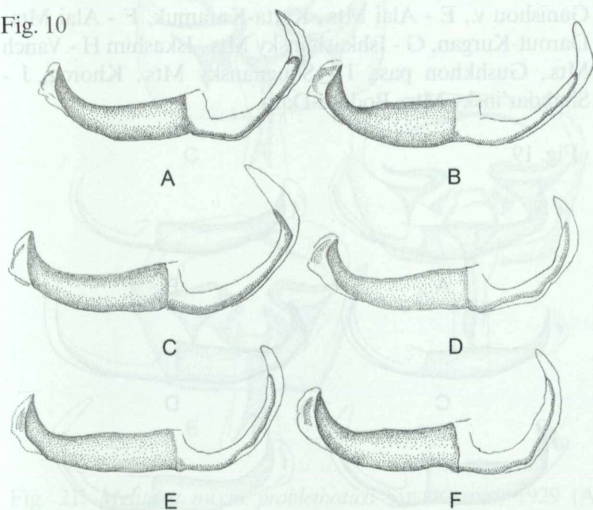


Fig. 10: *Melitaea didyma carminea* subspec. nov., ♂ genitalia. Aedeagus, lateral view: A - Chatkal Mts., Chap-Chama pass, B - Southern edges of Chatkal, Sumsar v., C - Chatkal Mts., Chanach r., D - Kuraminsky Range, Kamchik Pass., E - Chatkal Mts., Chimgan, F - Talas Alatau, Kara-Bura r.

Fig. 11

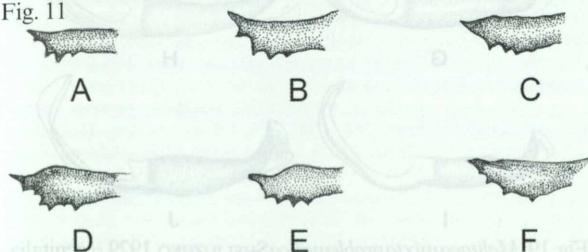


Fig. 11: *Melitaea didyma carminea* subspec. nov., ♂ genitalia. Harpe: A - Talas Alatau, Kara-Bura r., B - Chatkal Mts., Chimgan, C - Kuraminsky Range, Kamchik Pass., D - Chatkal Mts., Chap-Chama pass, E - Southern edges of Chatkal, Sumsar v., F - Chatkal Mts., Chanach r.

Fig. 9

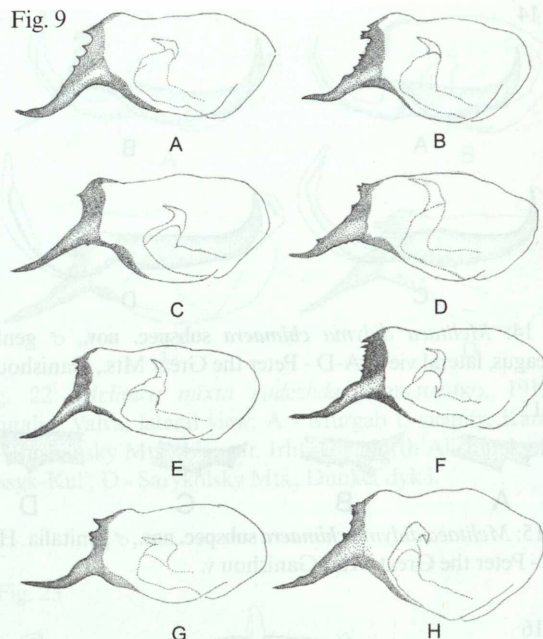


Fig. 9: *Melitaea didyma carminea* subspec. nov., ♂ genitalia. Valva, lateral view: A - Chatkal Mts., Chanach r., B - Chatkal Mts., Chak-Mack Su r., C - Talas Alatau, Kara-Bura r., D - Chatkal Mts., Chimgan, E - Kuraminsky Range, Kamchik Pass., F - Chatkal Mts., Terek-Sai v., G - Southern edges of Chatkal, Sumsar v., H - Chatkal Mts., Chap-Chama pass.

Fig. 12

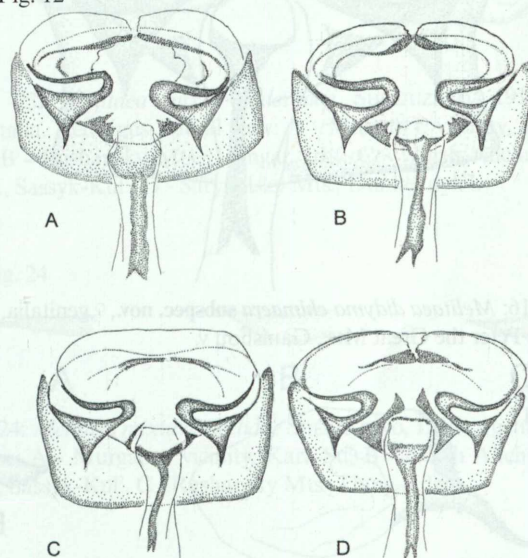


Fig. 12: *Melitaea didyma carminea* subspec. nov., ♀ genitalia, dorsal view: A - Chatkal Mts., Chanach r., B - Chatkal Mts., Chak-Mack Su r., C - Chatkal Mts., Chimgan, D - Talas Alatau, Kara-Bura r.

Fig. 13

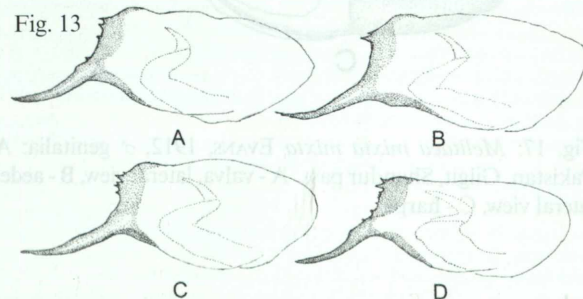


Fig. 13: *Melitaea didyma chimaera* subspec. nov., ♂ genitalia. Valva, lateral view: A-D - Peter the Great Mts., Ganishou v.

Fig. 14

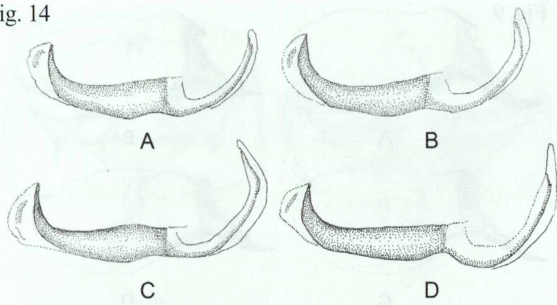


Fig. 14: *Melitaea didyma chimaera* subspec. nov., ♂ genitalia. Aedeagus, lateral view: A-D - Peter the Great Mts., Ganishou v.

Fig. 15

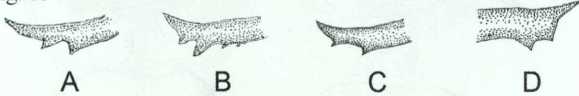


Fig. 15: *Melitaea didyma chimaera* subspec. nov., ♂ genitalia. Harpe: A-D - Peter the Great Mts., Ganishou v.

Fig. 16

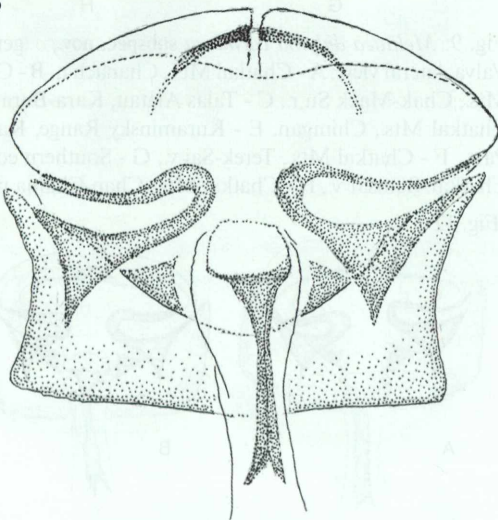


Fig. 16: *Melitaea didyma chimaera* subspec. nov., ♀ genitalia, dorsal view: Peter the Great Mts., Ganishou v.

Fig. 17

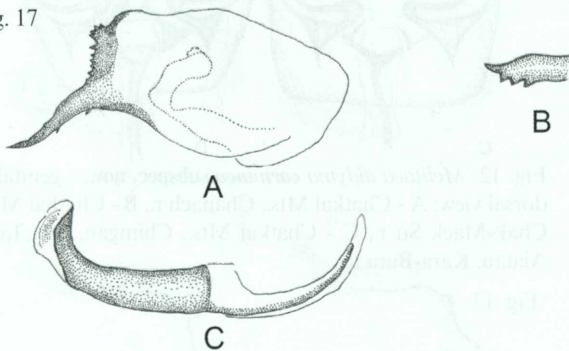


Fig. 17: *Melitaea mixta mixta* EVANS, 1912, ♂ genitalia: A-C - Pakistan, Gilgit, Shandur pass. A - valva, lateral view, B - aedeagus, lateral view, C - harpe.

Fig. 18

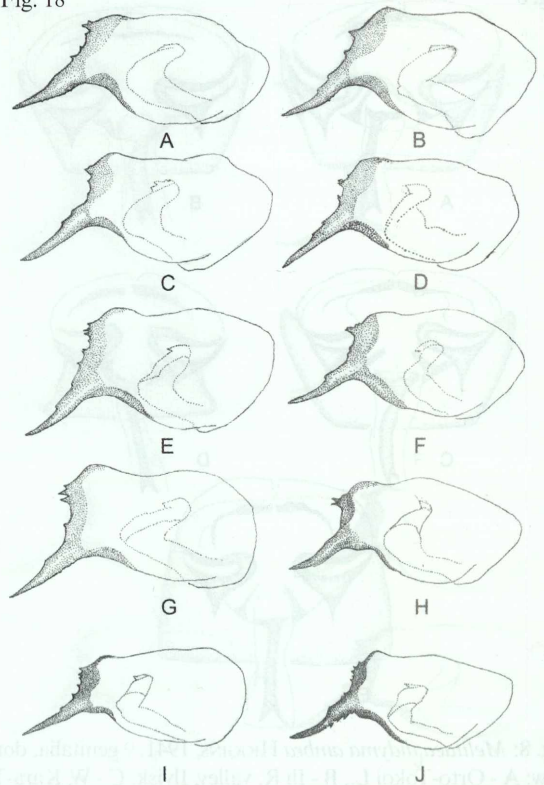


Fig. 18: *Melitaea mixta problematica* SHELJUZHKO, 1929, ♂ genitalia. Valva, lateral view: A-D - Peter the Great Mts., Ganishou v., E - Alai Mts., Katta-Karamuk, F - Alai Mts., Darout-Kurgan, G - Ishkashimsky Mts., Iskashim H - Vanch Mts., Gushkhon pass, I - Shugnansky Mts., Khorog, J - Shahdar'insky Mts., Bodom-Dara.

Fig. 19

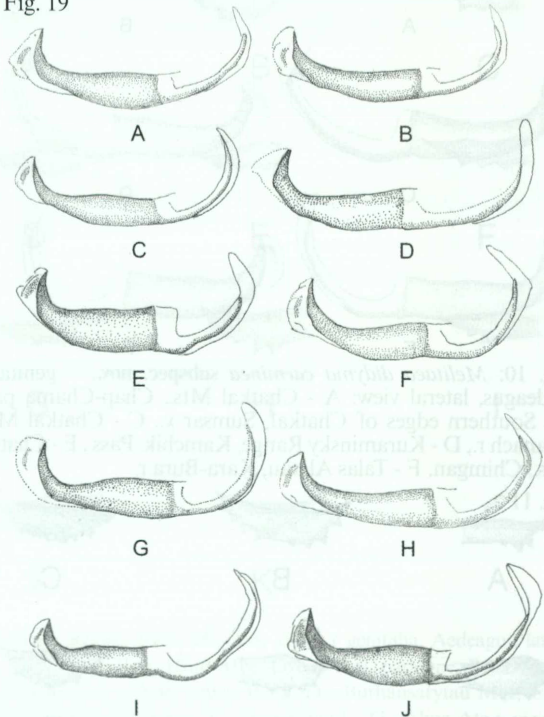


Fig. 19: *Melitaea mixta problematica* SHELJUZHKO, 1929, ♂ genitalia. Aedeagus, lateral view: A-D - Peter the Great Mts., Ganishou v., E - Alai Mts., Katta-Karamuk, F - Alai Mts., Darout-Kurgan, G - Ishkashimsky Mts., Iskashim, H - Vanch Mts., Gushkhon pass, I - Vanch Mts., Gushkhon pass, J - Shugnansky Mts., Khorog, K - Shahdar'insky Mts., Bodom-Dara.

Fig. 20

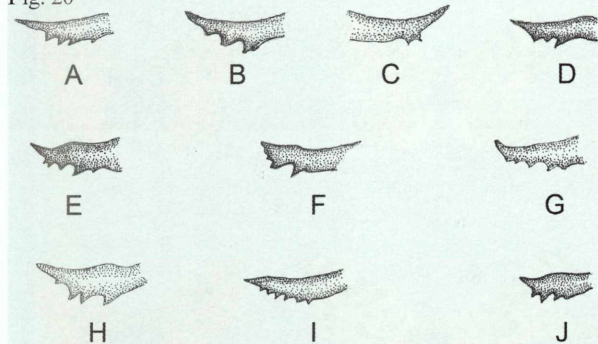


Fig. 20: *Melitaea mixta problematica* SHELJUZHKO, 1929, ♂ genitalia. Harpe: A-D - Peter the Great Mts., Ganishou v., E - Alai Mts., Katta-Karamuk, F - Alai Mts., Darout-Kurgan, G - Ishkashimsky Mts., Iskashim, H - Vanch Mts., Gushkhon pass, I - Shahdar'insky Mts., Bodom-Dara, J - Shugnansky Mts., Khorog.

Fig. 21

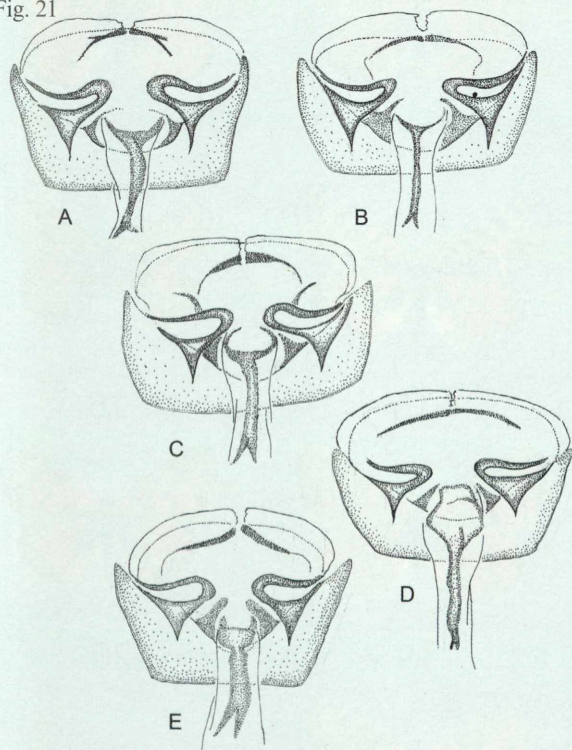


Fig. 21: *Melitaea mixta problematica* SHELJUZHKO, 1929 (A-D), *Melitaea mixta nadezhdae* SHELJUZHKO, 1912 (E-M), ♀ genitalia, dorsal view: A - Peter the Great Mts., Ganishou v., B - Shugnansky Mts., Khorog, C - Vanch Mts., Gushkhon pass, D - Alai Mts., Darout-Kurgan, E - Murgab t. vicinity, Kara-Su.

Fig. 22

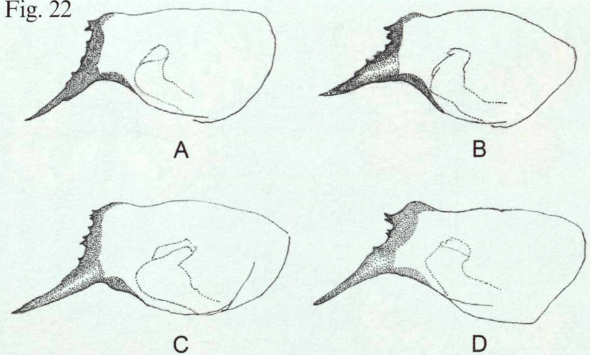


Fig. 22: *Melitaea mixta nadezhdae* SHELJUZHKO, 1912, ♂ genitalia. Valva, lateral view: A - Murgab t. vicinity, Kara-Su, B - Rushansky Mts., L'angar, Irht, C - North Alichursky Mts., Sassyk-Kul', D - Sarykolsky Mts., Dunkel' dyk l.

Fig. 23

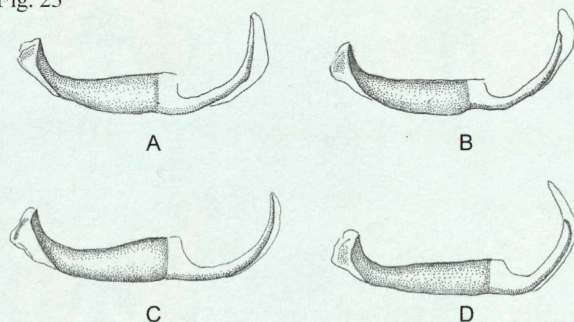


Fig. 23: *Melitaea mixta nadezhdae* SHELJUZHKO, 1912, ♂ genitalia. Aedeagus, lateral view: A - Murgab t. vicinity, Kara-Su, B - Rushansky Mts., L'angar, Irht, C - North Alichursky Mts., Sassyk-Kul', D - Sarykolsky Mts., Dunkel' dyk l.

Fig. 24

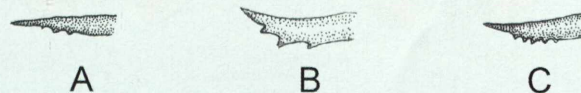
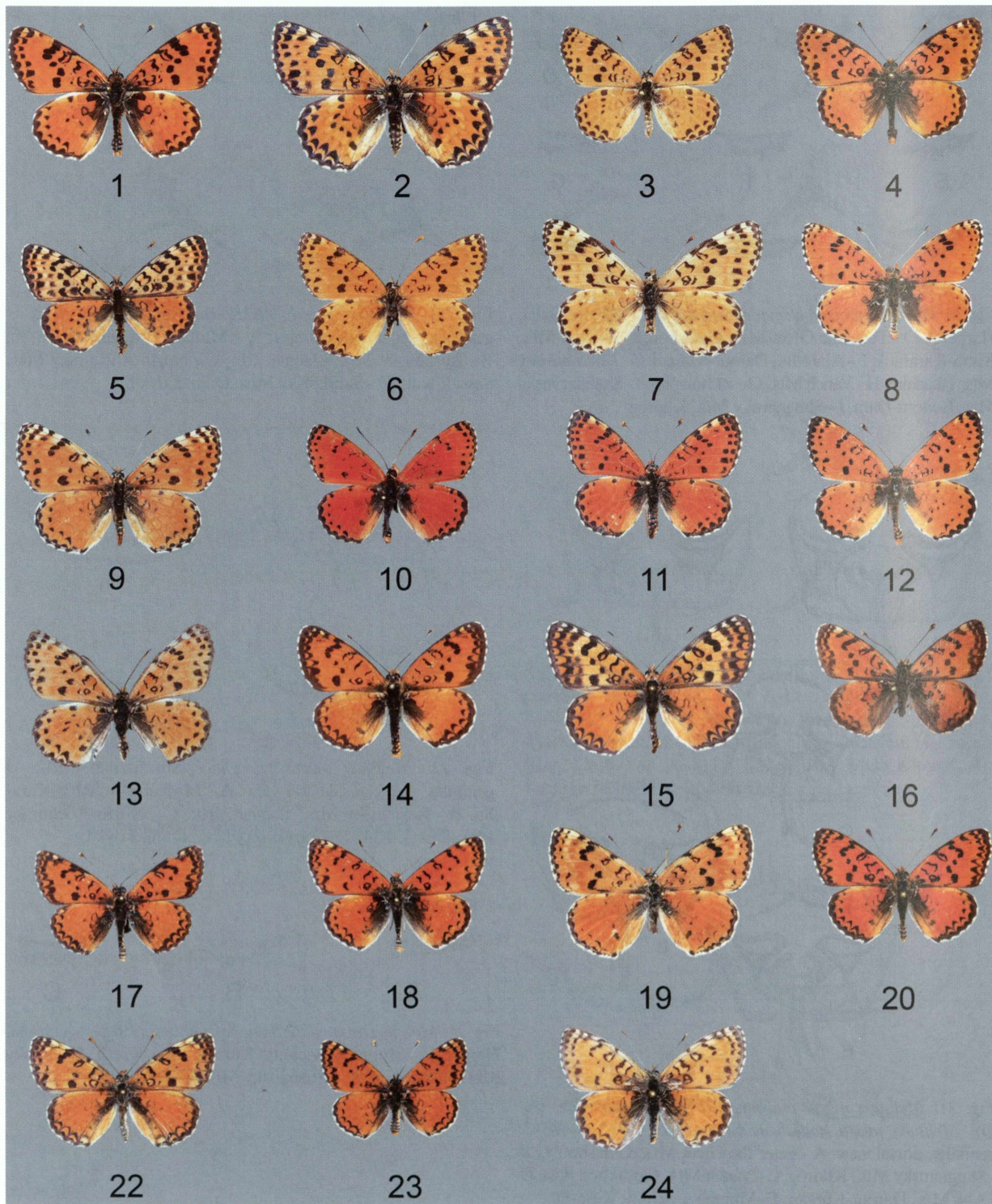


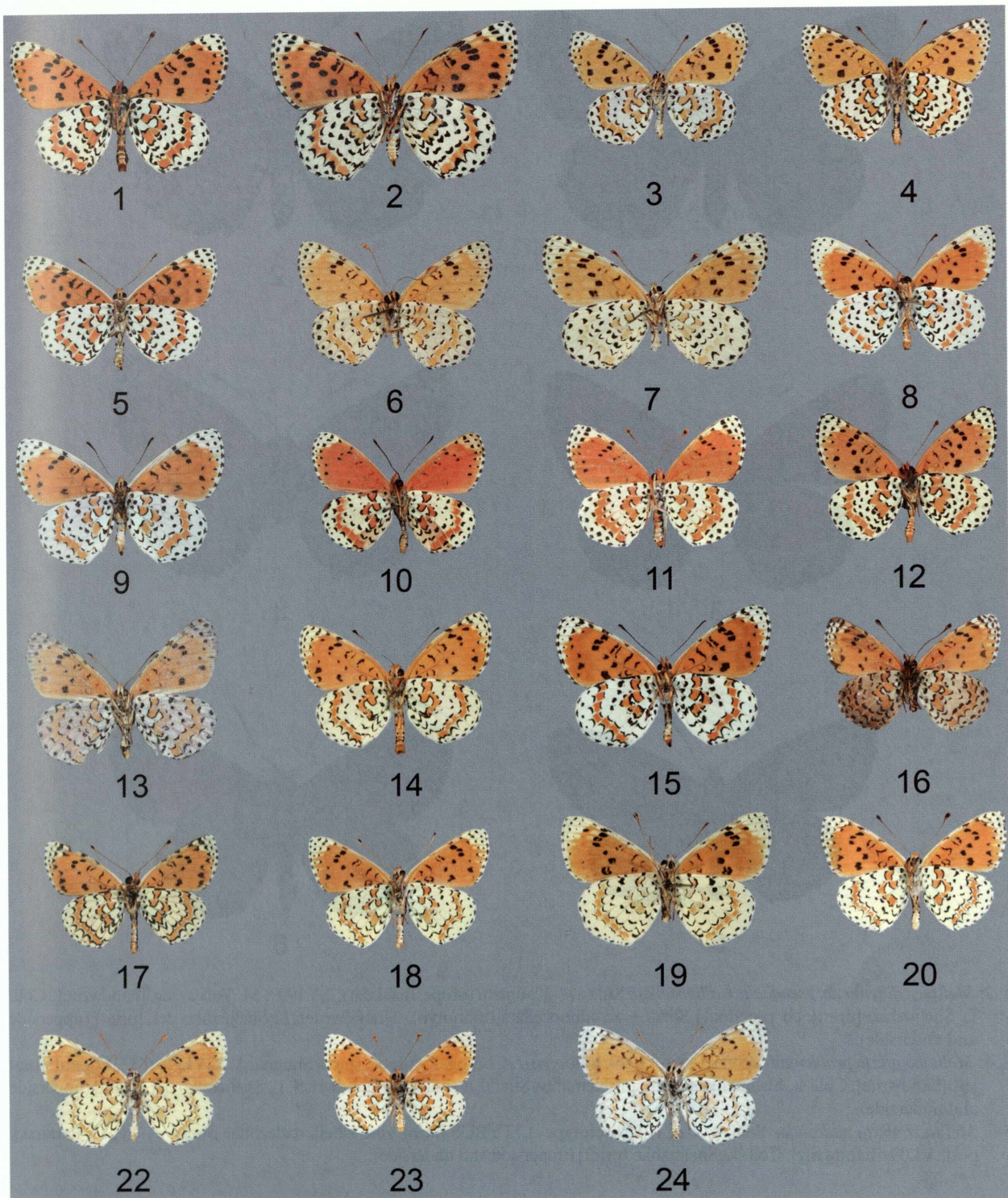
Fig. 24: *Melitaea mixta nadezhdae* SHELJUZHKO, 1912, ♂ genitalia. Harpe: A - Murgab t. vicinity, Kara-Su, B - North Alichursky Mts., Sassyk-Kul', C - Rushansky Mts., L'angar, Irht.

Colour plate 1



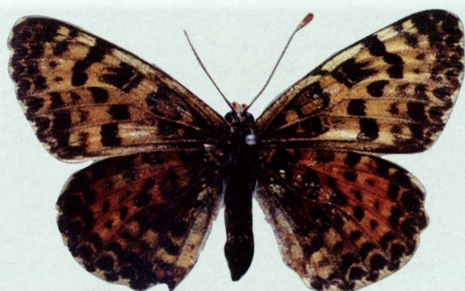
1, 2: *Melitaea didyma turkestanica* SHELJUZHKO, 1929, (1) ♂, Kyrgyzstan, Alai Mts, Jordan vic., Aksu river, 2000 m, 28.06.1995, V. TITOV leg. (2) ♀, Kyrgyzstan, Alai Mts, Jordan vic., Aksu river, 2000 m, 27.06.1995, V. TITOV leg. 3: *Melitaea didyma turkestanica* SHELJUZHKO, 1929 & *Melitaea didyma ambra* HIGGINS, 1941 (?), ♀, Kyrgyzstan, Alai Mts., 20 km SE Kyzyl-Kiya, Chauvay v., 1700 m, 26.-29.06.1995, PETROV A. leg. 4, 5: *Melitaea didyma ambra* HIGGINS, 1941 (f. *elavar* FRUHST.), Tadjikistan, Fanskie Mts., Urech r., 7 km S fr. Madovra v., Artuch loc. 2100-2200 m., 17.-25.06.1998, Y. VASILCHENKO leg., (4) ♂, (5) ♀. 6, 7: *Melitaea didyma ambra* HIGGINS, 1941, "Mel. Didyma var. Persica", "coll. Acad. Petrop., Dshungaria", GRUM.-GRSHIMAILO, (6) paralectotype ♂, (7) paralectotype ♀. 8, 9: *Melitaea didyma ambra* HIGGINS, 1941 (= *manoni* HANUS), Kyrgyzstan, W. edge of Kungei Alatau Mts., Boomscoe val., Kok-Mainak v., 1600-1700 m., 5-6.07.1998, S. CHURKIN leg. (8) ♂, (9) ♀. 10: *Melitaea didyma carminea* subsp. nov., holotype ♂, Kyrgyzstan, West Tian-Shan, Chatkal Mts., 25 km NE Zhany-Bazar, Kanish-Kia vill., Chanach river, 2600, 14.07.1999, K. KOLESNICHENKO. 11: *Melitaea didyma carminea* subsp. nov., paratype ♀, Kyrgyzstan, West Tian-Shan, Chandalash Mts., Chak-Mak-Su r., 2800, 18.07.2000, K. KOLESNICHENKO. 12, 13: *Melitaea didyma*, transitional between *M. d. carminea* subsp. nov. and *M. d. ambra* HIGGINS, (12) ♂, Kyrgyzstan, Talass Ala-Tau Mts., Kara-Bura river, 1600, 2.07.1999, K. KOLESNICHENKO. (13) ♀, Kyrgyzstan, Talass Ala-Tau Mts., Kara-Bura river, 1600, 2.07.1999, K. KOLESNICHENKO. 14, 15: *Melitaea didyma chimaera* subsp. nov., (14) holotype ♂, Tadjikistan, Peter the Great Mts., 23 km SE Tadjikobad, Ganishou v., 22.06.2003, PETROV A. leg. (17) ♂, 22.06.2003, (18) ♂, 28.-30.06.2003, (19) ♀, Tadjikistan, Peter the Great Mts., 23 km SE Tadjikobad, Ganishou v., 22.06.2003, PETROV A. leg. (20) ♂, W. Pamirs, Vanch Mts., Gyshkhun val., 3000 m, 25.-30.07.93, CHURKIN S. leg. (21) ♀, W. Pamirs, Vanch Mts., Gyshkhun val., 2000-2500 m, 1.-2.07.2001, PETROV A. leg. 22, 23: *Melitaea mixta nadezhdae* SHELJUZHKO, 1912, (22) ♂, E. Pamirs, Sarykolsky Mts., Dunkeldyk Lake, 4080 m, 28.07.1997, TITOV V. leg. (23) ♀, E. Pamirs, Sarykolsky Mts., Dunkeldyk L., 4100 m, 20.-24.07.1999, A. SOCHIVKO leg. 24: *Melitaea mixta nadezhdae* SHELJUZHKO, 1912, ♀.

Colour plate 2

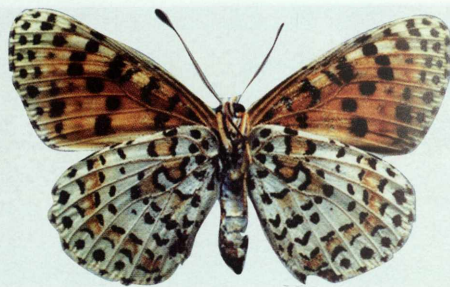


1, 2: *Melitaea didyma turkestanica* SHELJUZHKO, 1929, (1) ♂, Kyrgyzstan, Alai Mts, Iordan vic., Aksu river, 2000 m, 27.06.1995, V. TITOV leg. (2) ♀, Kyrgyzstan, Alai Mts, Iordan vic., Aksu river, 2000 m, 27.06.1995, V. TITOV leg. 3: *Melitaea didyma turkestanica* SHELJUZHKO, 1929 & *Melitaea didyma ambra* HIGGINS, 1941 (?), ♀, Kyrgyzstan, Alai Mts., 20 km SE Kyzyl-Kiya, Chauvay v., 1700 m, 26.-29.06.1995, PETROV A. leg. 4, 5: *Melitaea didyma ambra* HIGGINS, 1941 (f. *elavar* FRUHST.), Tadjikistan, Fanskies Mts., Urech r., 7 km S fr. Madovra v., Artuch loc. 2100-2200 m., 17.-25.06.1998, Y. VASILCHENKO leg., (4) ♂, (5) ♀. 6, 7: *Melitaea didyma ambra* HIGGINS, 1941, "Mel. Didyma var. Persica", "coll. Acad. Petrop., Dshungaria", GRUM.-GRSHIMAILO, (6) paralectotype ♂, (7) paralectotype ♀. 8, 9: *Melitaea didyma ambra* HIGGINS, 1941 (= *manoni* HANUS), Kyrgyzstan, W. edge of Kungei Alatau Mts., Boomscoe val., Kok-Mainak v., 1600-1700 m., 5-6.07.1998, S. CHURKIN leg. (8) ♂, (9) ♀. 10: *Melitaea didyma carminea* subsp. nov., holotype ♂, Kyrgyzstan, West Tian-Shan, Chatkal Mts., 25 km NE Zhany-Bazar, Kanish-Kia vill., Chanach river, 2600, 14.07.1999, K. KOLESNICHENKO. 11: *Melitaea didyma carminea* subsp. nov., paratype ♀, Kyrgyzstan, West Tian-Shan, Chandalash Mts., Chak-Mak-Su r., 2800, 18.07.2000, K. KOLESNICHENKO. 12, 13: *Melitaea didyma*, transitional between *M. d. carminea* subsp. nov. and *M. d. ambra* HIGGINS (12) ♂, Kyrgyzstan, Talass Ala-Tau Mts., Kara-Bura river, 1600, 2.07.1999, K. KOLESNICHENKO. (13) ♀, Kyrgyzstan, Talass Ala-Tau Mts., Kara-Bura river, 1600, 2.07.1999, K. KOLESNICHENKO. 14, 15: *Melitaea didyma chimaera* subsp. nov., (14) holotype ♂, Tadjikistan, Peter the Great Mts., Darai-Nazarak, 1.-8.07.2003, PAK O. leg. (15) paratype ♀, Tadjikistan, Peter the Great Mts., 23 km SE Tadjikobad, Ganishou v., 18.-25.06.2003, PAK O. leg. 16: *Melitaea mixta mixta* EVANS, 1912, ♂, Pakistan, Gilgit, Road Gilgit-Chitral, Shandur pass, 3700-4000, 6.-11.07.95, V. MAJOR leg. 17-21: *Melitaea mixta problematica* SHELJUZHKO, 1929, Tadjikistan, Peter the Great Mts., 23 km SE Tadjikobad, Ganishou v., PETROV A. leg. (17) ♂, 22.06.2003, (18) ♂, 28.-30.06.2003. (19) ♀, Tadjikistan, Peter the Great Mts., 23 km SE Tadjikobad, Ganishou v., 22.06.2003, PETROV A. leg. (20) ♂, W. Pamirs, Vanch Mts., Gyskhun val., 3000 m, 25.-30.07.93, CHURKIN S. leg. (21) ♀, W. Pamirs, Vanch Mts., Gyskhun val., 2000-2500 m, 1.-2.07.2001, PETROV A. leg. 22, 23: *Melitaea mixta nadezhdae* SHELJUZHKO, 1912, (22) ♂, E. Pamirs, Sarykolsky Mts., Dunkeldyk Lake, 4080 m, 28.07.1997, TITOV V. leg. (23) ♀, E. Pamirs, Sarykolsky Mts., Dunkeldyk L., 4100 m, 20.-24.07.1999, A. SOCHIVKO leg. 24: *Melitaea mixta nadezhdae* SHELJUZHKO, 1912, ♀.

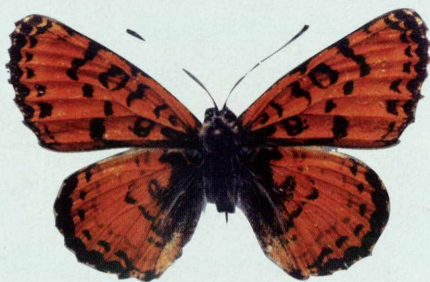
Colour plate 3



1



2



3



4



5



6

- 1, 2: *Melitaea didyma* ab. *pseudoala* + *alboocellata* SHELJ., ♀, Kauntshi (prope Tashkent), 3.V.1909. M. Volkov leg. [handwrite], Coll. L. Sheljuzhko [print], ab. *pseudoala* SHELJ. + ab. *alboocellata* (monotyp), ♀ [handwrite], L. Sheljuzhko det. [print] (upperside and underside).
 3, 4: *Melitaea mixta problematica* SHELJUZHKO, 1929, holotype ♂, Chorog, Pamir oc. (prov. Shugnan). 28.VI.1916, G. EGOROTSHKIN leg. [handwrite], Coll. L. Sheljuzhko [print], problematica SHELJ., ♂ (holotyp) [handwrite], L. Sheljuzhko det. [print] (upperside and underside).
 5-6: *Melitaea mixta nadezhdae* SHELJUZHKO, 1912, lectotype ♂, TYPUS [print, rose label], nadezhdae SHELJ. ♂, "type", Pamirsky post., VI.09. [handwrite], Coll. L. Sheljuzhko [print] (upperside and underside).

D



D: *Melitaea didyma ambra* HIGGINS, 1941. Larvae, Kazakhstan, "Bol'shie Barsuki" desert.

ZOBODAT - www.zobodat.at

Zoologisch-Botanische Datenbank/Zoological-Botanical Database

Digitale Literatur/Digital Literature

Zeitschrift/Journal: [Neue Entomologische Nachrichten](#)

Jahr/Year: 2011

Band/Volume: [67](#)

Autor(en)/Author(s): Kolesnichenko Kirill A., Churkin Sergei V., Berdiev Rustam K.

Artikel/Article: [A review of the East Palaearctic taxa of the *Melitaea didyma* \(Esper, \[1779\]\)-group. Part II. 257-278](#)